Ruminant Nutrition: Feed Additives 2

T152  Bacillus subtilis and Bacillus licheniformis used as probiotics to enhance lactation performance and milk branched-chain fatty acids in dairy cows. J. Lamontagne1, D. Ricol1, R. Gervais2, and P. Chouinard3, Université Laval, Québec, QC, Canada, 2Centre de recherche en sciences animales de Deschambault, Deschambault, QC, Canada.

Branched-chain fatty acids (BCFA) are generating interest for their benefits on human health particularly for their prebiotic effect on new-born gastrointestinal tract. Those fatty acids are synthesized by ruminal bacteria and incorporated into milk, the latter being the main source of BCFA in the North American diet. Some Bacillus genus species are used in animal production as direct-fed microbials and are known to synthesize BCFA to form their cell walls. Those probiotics have been shown to increase milk production and composition in small and large ruminants. To confirm that probiotics from the Bacillus genus can increase cow performance and affect milk fatty acid composition, 6 multiparous cows fitted with rumen cannula were used in a randomized replicated crossover design. Cows either received 200 g/d of whey powder as a control or 200 g/d of Bioplus 2B (Chr. Hansen, Milwaukee, WI), a commercial direct-fed microbial of Bacillus subtilis and Bacillus licheniformis, representing a daily dose of 6.4 × 10^11 cfu using whey powder as carrier. The 2 experimental periods lasted 14 d and a 7-d washout period was observed after each one. Samples were collected at d 0, 13 and 14 of each period. Milk production, composition and fatty acid profile as well as ruminal parameters and microbiota were evaluated. Data from d 0 were used as covariate. Treatments did not affect productivity and milk composition. The use of Bioplus 2B increased the relative concentration of anteiso 13:0 and anteiso 15:0 (P < 0.05) and tended to increase total concentration of BCFA (P < 0.10) compared with control. Treatments did not affect ruminal pH, ammonia nitrogen and concentrations of acetate, propionate and butyrate. However, Bioplus 2B increased concentration of isovalerate (P < 0.05) and tended to increase the concentration of isobutyrate (P < 0.10). This trial indicates that milk fatty acid profile is sensitive to ruminal microbiota modifications. Probiotics of the Bacillus genus could be used as part of a BCFA enhancing protocol to increased those fatty acids in dairy products.

Key Words: heat stress, inflammation, prebiotic


The objective of this study was to evaluate the effect of a postbiotic additive from Aspergillus oryzae (AO) on the inflammation response in lactating dairy cows exposed to heat stress. Thirty-six Holstein cows (105 ± 23 SD days in milk, 714 ± 23 kg body weight) were used in a completely randomized design and randomly assigned to 1 of 3 treatments for 36 d: 0 g/d (control, CNTL), 3 g/d (low), and 6 g/d (medium) of the AO postbiotic (Biozyme Inc., St. Joseph, MO). A 41% forage and 59% concentrate TMR (18.1% CP, 33.0% NDF, 1.61 Mcal/kg NEL) was individually fed twice daily, and AO was top-dressed twice daily. Cows experienced warm climate during June and July 2018. Cows were provided with heat abatement of fans and misters from d 1 to 10 (period 1) and without heat abatement from d 11 to 36 (period 2). Acute phase proteins [haptoglobin, serum amyloid A, and lipopolysaccharide (LPS) binding protein] were determined from plasma collected on d 11 and 35. On d 36, 2 whole blood samples were collected for an ex-vivo challenge with or without LPS (5 μg/μL). The expression of IL-1β, IL-6, and TNF-α was measured using qPCR. Three analyses were conducted on cytokine expression: 1) no LPS stimulation, 2) LPS stimulation, and 3) ratio of LPS to no LPS stimulation. Mild heat stress was attained in period 1, whereas heat stress intensity was increased in period 2 (temperature-humidity index = 74.6 ± 2.4 and 77.3 ± 4.2 [mean ± SD]). In period 1, AO quadratically decreased (P = 0.03) LPS binding protein concentrations in plasma by 25.7%. In period 2, AO quadratically decreased (P = 0.01) serum amyloid A concentrations in plasma by 65.6% and tended to quadratically decrease (P ≤ 0.10) haptoglobin and LPS binding protein concentrations by 35.4 and 23.3%, respectively. From the ex vivo LPS challenge, AO linearly decreased (P = 0.02) the IL-6 expression ratio (LPS to no LPS stimulation) by 65.6%. In summary, AO decreased markers of inflammation and cytokine production in cows exposed to heat stress. These findings may be associated with improvements of health in cows exposed to heat-stress.

Key Words: heat stress, inflammation, prebiotic


The objective of this study was to evaluate the effect of a commercial yeast culture, [Cellerate Culture Classic Plus (CC+), Phibro Animal Health Corp.] on volatile fatty acid (VFA) production, in vitro dry matter digestibility (IVDMD), and kinetics of gas production using an in vitro rumen fermentation system and lactating cow TMR. Bottle (250 mL) was considered the experimental unit; each bottle contained TMR (1.4 g) and treatment in 100 mL of buffered rumen fluid. Treatments were: CNTL (no additive) and CC+ (14 mg/bottle). All treatments were incubated in triplicate for 24 h at 39°C and constant agitation (60 rpm). Bottles were capped with units to capture temperature and pressure every 15 min (RFI, Ankom Technology, Macedon, NY). At the end of incubation, final pH and temperature measurements were taken; a sample of rumen fluid was frozen for analysis of VFA. Triplicate 50-mL centrifuge tubes were incubated in parallel with larger bottles to assess IVDMD; tubes contained 0.5 g TMR, 5 mg CC+ and 32 mL buffered rumen fluid. Three replicate incubation days were performed, data were analyzed using PROC GLIMMIX of SAS; significance was defined as P ≤ 0.05 and tendencies as 0.05 < P ≤ 0.10. Treatment did not affect gas production kinetics, final pH, final temperature, IVDMD, isobutyric, isovaleric, or valeric acid (mmol/L) concentrations, or VFA production analyzed on a proportional basis. Including CC+ (vs CNTL) increased total acetic acid (70.09 vs 68.12 ± 4.01 mmol/L; P = 0.02), butyric acid (9.51 vs 9.32 ± 0.56 mmol/L; P = 0.04) and total VFA concentrations (105.38 vs 102.69 ± 7.12 mmol/L; P = 0.02). Our results indicate adding yeast culture to a lactating cow diet may increase VFA production without altering kinetics of gas production, pH or temperature in an in vitro system which may modulate ruminal fermentation.

Key Words: yeast culture, volatile fatty acid, rumen

T155  Supplementation of dairy cows with a blend of direct-fed microbes: Performance and digestion. L. N. Resende1, R. B. Silva2, R. A. N. Pereira1,2, and M. N. Pereira*1, 1Universidade Federal de Lavras, Lavras, MG, Brazil, 2Better Nature Research Center, Ifaci, J. Dairy Sci. Vol. 102, Suppl. 1
Probiotics (PBT) may improve diet digestibility and lactation performance of dairy cows. This experiment evaluated the effect of a liquid supplement containing a blend of viable lactic acid bacteria, spore forming bacteria, and yeast (S. cerevisiae) cultured in consortium (Global Saúde, Brazil/SCD Probiotics, USA) on digestion, intake, and lactation performance of dairy cows. Twenty-six Holstein cows (185 ± 141 DIM) were individually fed a standard TMR for 14 d and treatments control or PBT (3.5 mL/kg of TMR DM) for 56 d, in a covariate adjusted randomized block design with repeated measures over time. The PBT increased DMI (23.5 vs 22.5 kg/d; P = 0.01, SEM 0.07) and tended to increase the yields of milk (30.0 vs 29.4 kg/d; P = 0.06, SEM 0.50) and lactose (+ 60 g/d; P = 0.09). Energy-corrected milk to DMI ratio was reduced by PBT (1.25 vs 1.31; P = 0.02, SEM 0.033). Milk solids concentration and yield did not differ (P ≥ 0.28). Cows fed PBT tended to have higher BCS (3.02 vs 2.91; P = 0.08, SEM 0.039), but BW did not differ (641 kg; P = 0.27). The PBT tended to reduce the total-tract digestibility of the non-fibrous OM (81.2 vs 84.1%; P = 0.08, SEM 1.11) whereas starch (90.7%) and NDF (48.4%) digestibilities did not differ (P ≥ 0.20). Molar proportion of butyrate in ruminal fluid tended to be reduced by PBT (9.4 vs 10.4%; P = 0.06, SEM 0.40) as well as total protozoa concentration (P = 0.10). The acetate to propionate ratio (3.1; P = 0.89) and the ruminal microbial yield estimated by the daily urinary allantoin excretion (P = 0.21) did not differ. The PBT reduced the proportion of daily intake in the morning (35.1 vs 40.4%; P = 0.02, SEM 1.52) and increased the proportion in the afternoon (45.9 vs 41.9%; P = 0.03, 1.23). Rumination and ingestion behaviors did not differ (P ≥ 0.16). The PBT reduced blood urea-N at 0900 h (P = 0.01) and tended to reduce at 1630 h (P = 0.06) and 2300 h (P = 0.09), but did not affect milk urea-N (18.6 mg/dL; P = 0.47, SEM 0.44). The PBT induced a greater increase in DMI than in milk yield, decreasing feed efficiency, and had effects on digestibility and ruminal fermentation profile.

**Key Words:** probiotic, direct-fed microbes, yeast

T156  **Supplementation of dairy cows with a blend of direct-fed microbes: Thermoregulation and immunity.** L. N. Resende1, R. B. Silva2, A. P. Peconick1, R. A. N. Pereira1,2, and M. N. Pereira1,2, 1Universidade Federal de Lavras, Lavras, MG, Brazil, 2Better Nature Research Center, Ijaci, MG, Brazil, 3Empresa de Pesquisa Agropecuaria de Minas Gerais, Lavras, MG, Brazil.

Probiotics (PBT) may have systemic effects on dairy cows. This experiment evaluated the effect of a liquid supplement containing a blend of viable lactic acid bacteria, spore forming bacteria, and yeast (S. cerevisiae) cultured in consortium (Global Saúde, Brazil/SCD Probiotics, USA) on body temperature and immune response of dairy cows. Twenty-six Holstein cows (185 ± 141 DIM) were individually fed a standard TMR for 14 d and treatments control (CTL) or PBT (3.5 mL/kg of TMR DM) for 56 d, in a covariate adjusted randomized block design with repeated measures over time. The PBT increased DMI (23.5 vs 22.5 kg/d; P = 0.01, SEM 0.07) and tended to increase the yields of milk (30.0 vs 29.4 kg/d; P = 0.06, SEM 0.50) and lactose (+ 60 g/d; P = 0.09). Energy-corrected milk to DMI ratio was reduced by PBT (1.25 vs 1.31; P = 0.02, SEM 0.033). Milk solids concentration and yield did not differ (P ≥ 0.28). Cows fed PBT tended to have higher BCS (3.02 vs 2.91; P = 0.08, SEM 0.039), but BW did not differ (641 kg; P = 0.27). The PBT tended to reduce the total-tract digestibility of the non-fibrous OM (81.2 vs 84.1%; P = 0.08, SEM 1.11) whereas starch (90.7%) and NDF (48.4%) digestibilities did not differ (P ≥ 0.20). Molar proportion of butyrate in ruminal fluid tended to be reduced by PBT (9.4 vs 10.4%; P = 0.06, SEM 0.40) as well as total protozoa concentration (P = 0.10). The acetate to propionate ratio (3.1; P = 0.89) and the ruminal microbial yield estimated by the daily urinary allantoin excretion (P = 0.21) did not differ. The PBT reduced the proportion of daily intake in the morning (35.1 vs 40.4%; P = 0.02, SEM 1.52) and increased the proportion in the afternoon (45.9 vs 41.9%; P = 0.03, 1.23). Rumination and ingestion behaviors did not differ (P ≥ 0.16). The PBT reduced blood urea-N at 0900 h (P = 0.01) and tended to reduce at 1630 h (P = 0.06) and 2300 h (P = 0.09), but did not affect milk urea-N (18.6 mg/dL; P = 0.47, SEM 0.44). The PBT induced a greater increase in DMI than in milk yield, decreasing feed efficiency, and had effects on digestibility and ruminal fermentation profile.

**Key Words:** probiotic, direct-fed microbes, yeast

T157  **Evaluation of supplemental autolyzed yeast on ruminal pH, fecal pH, and VFA response from Holstein cows fed a high starch diet.** S. E. Knollinger1, B. Miller2, I. Mueller3, and F. C. Cardoso1, 1University of Illinois, Urbana, IL, 2BIOMIN America Inc., Overland Park, KS, 3BIOMIN Holding GmbH, Getzersdorf, Austria.

High starch diets are known to reduce rumen pH, and cause shifts in the VFA profile, resulting in potential health problems. The aim of this study was to investigate if the addition of autolyzed yeast (AY; Saccharomyces cerevisiae) supplementation in a high starch lactation diet would improve rumen pH, fecal pH, and shifts in VFA response. Fifteen rumen-cannulated Holstein cows were assigned to 1 of 5 treatments in a replicated 5 × 5 Latin square design balanced to measure carryover effects. Treatments were: low starch diet without AY (LS0); control, high starch diet without AY (HS0), high starch diet with either 15 g (HS15), 30 g (HS30), or 45 g (HS45) of AY supplementation. The period of 21 d was divided into the adaptation phase (d 1 to 14) and a measurement phase (d 15 to 21). Rumen fluid was collected via rumen cannula on d 15 and 16 in relation to feeding at 1400 h (time point 0). Rumen samples were extracted at 0, 4, 8, 12, 16, 20, and 24 h relative to feeding. Cows in HS0 experienced lower ruminal pH (6.10 vs. 6.38; P < 0.0001), nadir pH (5.53 vs. 5.74; P < 0.0001), and fecal pH (6.71 vs. 6.95; P = 0.042) compared with LS0. The addition of AY increased rumen pH (P = 0.04), and nadir pH (P = 0.009), compared with HS0 with no effect on fecal pH. Supplementing AY reduced individual VFA proportions of acetate, isobutyrate, and isovalerate (P = 0.02; P = 0.0004 and P = 0.002, respectively) when compared with cows in HS0. Total VFA proportion was greatest (136.71 mmol/L; P = 0.0005) in cows fed HS0 compared with LS0. Total VFA proportions were greater for propionate (23.87 vs. 20.75%; P < 0.0001) and valerate (1.50 vs. 1.35%; P = 0.0001) for cows in HS0 than LS0. Supplementing AY positively increased total propionate proportion (P = 0.002) and negatively decreased total acetate (P < 0.0001), isobutyrate, (P = 0.0003), and isovalerate (P = 0.01) when compared with HS0. Total VFA acetate (65.51 vs. 62.41%; P < 0.0001), isobutyrate (0.85 vs. 0.78%; P = 0.0001), and isovalerate (0.63 vs. 0.60%; P = 0.02) were greater in LS0 treatment compared with HS0. In conclusion, these results confirm the addition of AY aids in increased rumen pH values and shifts in VFA response.

**Key Words:** rumen pH, VFA, yeast

T158  **Evaluation of supplemental autolyzed yeast on the presence of inflammatory biomarkers from Holstein cows fed a high starch diet.** J. Dairy Sci. Vol. 102, Suppl. 1
The aim of this study was to investigate an AY (Saccharomyces cerevisiae) supplementation in high starch lactation diets and its effect on blood metabolites, in particular inflammatory biomarkers. Fifteen rumen-cannulated Holstein cows were assigned to 1 of 5 treatments in a replicated 5 × 5 Latin square design balanced to measure carryover effects. Treatments were: low starch diet without AY (LS0; control), high starch diet without AY (HS0), high starch diet with either 15 g (HS15), 30 g (HS30), or 45 g (HS45) of AY supplementation. The period of 21 d was divided into the adaptation phase (d 1 to 14) and a measurement phase (d 15 to 21). Blood was sampled from the coccygeal artery or vein at 0600 h on d 15, 18, and 21 (n = 3) of each period from each cow. Data collected were analyzed using the MIXED procedure of SAS. Orthogonal contrasts were used. Contrasts; CONT1 = LS0 compared with HS0; CONT2 = HS0 compared with the average of the 3 AY treatments (HS0, HS15, HS45) and linear and quadratic treatment effects (HS0, HS15, HS30, and HS45). NEFA (93.69 vs. 82.71 ± 4.08 μEq/L; P = 0.04) was greater in cows fed LS0; insulin (0.93 vs. 0.74 ± 0.10 μg/L; P = 0.04) concentration was greater in cows fed HS0. Plasma gamma-glutamyl transferase (GGT; 26.09 vs. 24.94 ± 3.57 U/L; P = 0.05), and mineral phosphorus (5.86 vs. 5.38 ± 0.15 mg/dL; P = 0.005) concentrations were greater in HS0 compared with LS0. However, the LS0 diet had greater total protein (7.60 vs. 7.43 ± 0.42 g/dL; P = 0.03), and bilirubin (0.14 vs. 0.12 ± 0.008 mg/dL; P = 0.03) when compared with cows fed HS0. Supplementing AY to cows had greater plasma total protein (P = 0.008), globulin (P = 0.008), serum amyloid A (SAA; P = 0.02), but lower albumin:globulin (P = 0.03), and tendency for lower superoxide dismutase activity (SOD; P = 0.07; CONT2). Linear treatments effects for plasma BHB (0.52 ± 0.03 mmol/L; P = 0.08) was higher at HS15. In conclusion, cows in HS0 had lower insulin, total bilirubin and protein compared with LS0 but greater concentrations of albumin:globulin, and tendency for SOD compared with treatments with added AY (CONT2).

**Key Words:** high starch, yeast, inflammation

**T159** Efficacy of exogenous amylases in increasing in vitro dry matter digestibility of dent corn. A. Oyebade1, K. Arriola1, D. Kim1, Y. Jiang1, A. Pech-Cervantes1, E. Duvalsiang1, F. Amaro1, C. McCary1, C. Heinzen1, X. Xue1,2, B. Saylor1, A. Adesogan1, and J. D. Kirk2. 1Department of Animal Sciences, University of Florida, Gainesville, FL, 2Inner Mongolia Academy of Agriculture and Animal Husbandry Sciences, Hohhot, Inner Mongolia, China.

The objective was to examine the efficacy of 8 amylases at increasing in vitro dry matter digestibility (IVDMD), ruminal fluid pH, ammonia-nitrogen (NH3-N) and volatile fatty acids (VFA) concentration resulting from fermentation of dent corn (DC; 4-mm, ground; 0.5 g per F57 ANKOM bag). The 8 amylases (5Trga, 15C3281, 22Amylex, 23LAT, 27Trga, 29PZ, 35C4687, 36C8955) differed in activity and were applied at doses of 0 (Control; CON) 0.25, 0.50, and 1.0 mg/g DM of DC and compared with a positive (Flaked corn; FC) and negative (Flint corn) control. Three ruminally-cannulated lactating dairy cows were used as rumen fluid donors and the substrate was in buffered ruminal fluid at 39°C in quadruplicate in 3 independent runs. Gas production was measured at 2, 5, and 7 h, while IVDMD and pH were measured at 7 h of incubation. Data were analyzed using the GLIMMIX procedure of SAS and differences were considered significant at P ≤ 0.05. Treatments and sampling time (for gas production) were used as fixed effects while run was considered a random factor. Enzymes 22Amylex and 36C8955 increased IVDMD relative to CON regardless of the dose used. However, 5Trga, 27Trga and 23LAT increased IVDMD at the 1.0 mg/g DM dose, while 29PZ did at doses of 0.50 and 1.0 mg/g DM. Only 22Amylex increased IVDMD relative to FC at the 0.50 and 1.0 mg/g DM doses. Also, 22Amylex increased gas production at the 1.0 mg/g DM dose after 5 and 7 h of incubation, and decreased molar proportion of acetate at the 0.50 and 1.0 mg/g DM doses, relative to CON. The molar proportion of butyrate was greater with 5Trga and 22Amylex at 0.50 and 1.0 mg/g DM doses, respectively, while isobutyrate was greater for 5Trga, 23LAT, and 27Trga at the 1.0, 0.50, and 0.25 mg/g DM doses, respectively, compared with CON. No treatment differences were observed for concentrations of NH3-N, total VFA, propionate and acetate:propionate ratio. Amylases 22Amylex, 36C8955, 29PZ, 5Trga, 27Trga, and 23LAT increased IVDMD and their efficacy should be validated with in vivo studies.

**Key Words:** OmniGen-AF, lactating cow, PBMC proliferation

**T161** Effects of withdrawing OmniGen-AF from lactating cow diet on performance and peripheral blood mononuclear cells proliferation. T. N. Marins1, J. O. S. Calix1, R. M. Orellana1, J. K. Bernard1, M. Garcia2, D. J. McLean2, D. J. Chapman2, D. J. Kirk2, and S. Tao1. 1University of Georgia, Tifton, GA, 2Phibro Animal Health Corp., Teaneck, NJ.

Supplementation of OmniGen-AF (OG) improves innate immunity and affects stress hormone concentrations in blood. However, it is not known if immune benefits persist in lactating cows after OG is removed from the diet. The aim was to evaluate the effect of withdrawing OG from the diet on performance, stress hormone concentrations, and peripheral blood mononuclear cells (PBMC) proliferation of mid-lactation dairy cows. Multiparous Holstein cows (n = 32), blocked by parity and days in milk (109 ± 39 d), were randomly assigned to 2 dietary treatments within each block: TMR top dressed with OG (56 g/d) or placebo (CON, 56 g/d). Cows were housed in the same free-stall pen, and fed individually 1×/d through Calan gates. All cows were fed the same diet containing OG before the onset of treatments, for at least 60 d. Cows were milked 3×/d and milk yield was recorded at each milking. Milk composition was analyzed weekly. Body weight and condition score were measured weekly. Blood samples were collected at −1, 1, 3, 5, and 7 wk relative to the onset of treatments for cortisol and prolactin (PRL) analyses, and isolation of PBMC. PBMC were cultured with hydrocortisone, PRL, concanavalin A (ConA), lipopolysaccharides (LPS), or their combinations for 72 h ex vivo to determine proliferative responses. Data were analyzed using PROC MIXED of SAS. Withdrawing OG from the diet of mid-lactation dairy cows with no physical signs of disease and not subjected to an in vivo immune challenge did not affect (P > 0.1) milk yield or composition, DMI, body weight, and blood concentrations of cortisol and PRL. Compared with CON cows, OG cows maintained greater body condition score (P = 0.04). Relative to CON cows, PBMC from OG cows had greater proliferative rate when stimulated by LPS (P = 0.03), but not by ConA ex vivo. There were no interactions (P > 0.1) between dietary treatments and addition of hormones on PBMC proliferation. In conclusion, withdrawing OG from the diet of mid-lactation cows impaired proliferative responses of PBMC stimulated by LPS, suggesting OG supplementation enhances immune response.

**Key Words:** OmniGen-AF, lactating cow, PBMC proliferation
Sodium acetate and sodium bicarbonate increase milk fat yield through different mechanisms. C. I. Matamoros* and K. J. Harvatine, Department of Animal Science, The Pennsylvania State University, University Park, PA.

Sodium acetate (NaAcet) treatment increases milk fat yield when ruminally infused or mixed in a TMR. Sodium acetate increases acetate supply, but also increases dietary cation-anion difference (DCAD), which can also increase milk fat yield. Our objective was to determine if the effect of NaAcet on milk fat production is due to increasing acetate supply or DCAD. The study included 12 multiparous cows in a replicated 3x3 Latin square balanced for carryover effects with 14 d periods. Treatments were control TMR (17% CP, 30% NDF, 26% starch, and 5% EE on DM basis), NaAcet providing 590 g/d of acetate, and sodium bicarbonate (NaHCO3) providing an equal amount of sodium as the acetate treatment. All treatments were mixed in the control TMR and fed ad libitum once a day and intake was recorded daily. Milk production was recorded daily with an integrated milk meter and milk components and milk fatty acid profile were determined the last 2 d of each period. Blood and fecal samples were collected every 9 h during the last 3 d of each period. Plasma acetate was determined by GC/MS. Production data were analyzed in JMP Pro 13 using a model that included the random effect of cow and period and fixed effect of treatment and a protected LSD mean separation. Plasma metabolites were analyzed with proc mixed in SAS 9.4 with repeated measures. Milk yield was not different between treatments, but NaAcet and NaHCO3 increased dry matter intake by 6.6 and 7%, respectively (P < 0.02). Milk fat yield was increased 134 g by NaAcet and 118 g by NaHCO3 (P < 0.01). Sodium acetate increased milk fat yield predominantly by increasing the yield of de novo and mixed source fatty acids, while NaHCO3 increased the yield of preformed and de novo fatty acids. Sodium acetate increased plasma acetate and decreased plasma glucose concentration during the afternoon and early evening, which coincides with the higher intake period of the day. In conclusion, NaAcet and NaHCO3 both increase milk fat production, but NaAcet achieves this through increased mammary gland de novo lipogenesis.

**Key Words:** de novo fat, acetate, dietary cation-anion difference (DCAD)


Feeding direct-fed microbials (DFM) to lactating dairy cattle has been demonstrated to improve milk production efficiency and alter milk composition. The objectives of this experiment were to evaluate the effects of feeding a DFM on milk production, feed intake, and milk composition of midlactation dairy cows. Forty-eight multiparous Holstein cows were assigned randomly to 1 of 2 treatments: 1) a basal control diet (CON) and 2) a basal control diet top-dressed with 96 g of ground corn and 4 g of a lactate-producing direct-fed microbial (DFM; 10-G; Life Products, Inc., Norfolk, NE). All cows had ad libitum access to feed offered at 0800 and 1600 h via individual feeding gates and were milked 3 times daily (0800, 1400, and 2000 h). Milk production and feed intake were recorded daily whereas BW, BCS, and milk components were determined weekly over the experimental period (14 weeks). Data were analyzed by using repeated measures in the MIXED procedure of SAS. Cows supplemented with DFM had similar milk yield compared with CON cows (40.8 and 41.5 ± 1.80 kg/d, respectively P = 0.76). Likewise, DMI was similar for both treatments and averaged 26.2 ± 0.58 kg/d (P = 0.77). Milk urea nitrogen tended to decrease in DFM cows compared with CON cows (12.84 vs 13.44 ± 0.28 mg/dL, respectively P < 0.13). The trend for lower MUN was accompanied by a concomitant numerical increase in milk protein percentage in DFM cows compared with CON cows (3.24 vs 3.18 ± 0.05%, respectively P = 0.37) with no differences in milk fat concentration (average 3.82 ± 0.12% for both treatments; P = 0.88), thus resulting in similar yield of energy corrected milk (43.73 ± 1.84 kg/d; P = 0.88). Interestingly, SCC was reduced (P = 0.03) from 278,800 to 273,800 ± 53,700 cells/mL when cows were supplemented with DFM. Similarly, log10-transformed SCC from cows consuming DFM tended to decrease compared with CON cows (P = 0.11). Supplementation of DFM to lactating Holstein cows appears to improve milk nitrogen use efficiency and decrease SCC while maintaining DMI and milk production.

**Key Words:** probiotic, rumen health, feed additives

T164 Effects of garlic extract and citrus flavonoid feed additive on dairy cow performance. B. W. Jones1,2, W. B. Smith1, C. R. Travis1, B. D. Lambert1,2, J. P. Muir2,3, and E. Kan2,3, 1Tarleton State University, Stephenville, TX, 2Texas A&M AgriLife Research, Stephenville, TX.

Feed additives that claim to reduce enteric methane exist. However, these feed additives have not been evaluated on how they affect dairy cattle performance. Therefore, the objective of this study was to evaluate the effects of a garlic extract and citrus flavonoid feed additive on the performance of dairy cows. Multiparous crossbred dairy cattle (n = 48) were housed at the Southwest Regional Dairy Center in Stephenville,
TX. All cows were housed in a sand-bedded freestall pen equipped with a Calan Broadbent feeding system (American Calan, Inc., Northwood, NH) to allow for individual feedings. The control diet (CON) was the basal total mixed ration. The treatment diet (TRT) had the feed additive top-dressed daily as 15 g of a pelleted supplement. Both diets were offered at 110% of the previous day’s consumption. Orts were collected before daily feeding and weighed for determination of ad libitum consumption. All cows were adapted to the diets and facilities for 14 d followed by a 77-d data collection period. Cows were milked 3 times daily and milk yield was averaged daily. Milk samples were collected at each milking one day each week and were averaged daily. Data were analyzed as a randomized complete block design, with pen serving as the random blocking factor. The MIXED procedure of SAS (SAS Institute Inc., Cary, NC) was used to evaluate the fixed effects of treatment with day as a repeated measurement on the subject of cow. No statistical differences were observed in daily intake (P = 0.63) or milk yield (P = 0.33) at 58.70 and 58.00 and 46.10 and 44.00 kg/day between CON and TRT, respectively. No significant differences existed (P > 0.05) between fat percent at 4.10 and 4.20, protein percent at 3.30 and 3.30, urea percent at 11.20 and 11.40, acetone percent at 0.04 and 0.05, lactose percent at 4.80 and 4.80, and solids nonfat percent at 8.90 and 9.10 for CON and TRT, respectively. The data suggests that the addition of the garlic extract and citrus flavonoid feed additive does not affect dairy cow performance.

Key Words: feed additive, garlic extract, citrus flavonoid

T165 Effects of additives based on phytogens, yeast products, and direct-fed microbials in milk replacers and starters for Holstein calves. K. N. Brost*, 1, D. P. Compart2, and J. K. Drackley1, 1University of Illinois, Urbana, IL, 2Land O'Lakes Inc., Arden Hills, MN.

The objective of this study was to determine if feed additives in non-medicated milk replacer (MR) and starter could improve health and growth of Holstein calves through 13 wk of age. The experiment was a randomized complete block design with 30 male calves per treatment, purchased when < 3 d old from a commercial farm. Treatments were: control MR and starter with no additives (CON); a commercially available phytogen and yeast extract (Surmount, PMI Nutrition, Arden Hills, MN) in MR and a blend of yeast products and phytogenics (Victant, PMI Nutritional Additives) in starter (CTP); and the same MR with starter (CEP) containing an experimental blend of direct-fed microbials and phytogens (Calf EXP Pak, PMI Nutrition). Intakes of MR, starter, and water were recorded daily. Measurements of BW, body length (BL), withers height (WH), hip height (HH), and hip width (HW) were recorded weekly. Calves were weaned on d 49 and moved from individual hutches to group housing by treatment group on d 56. Calves remained in groups until d 91. Growth and intake data were analyzed using the MIXED procedure and health data were analyzed using GLIMMIX and FREQ procedures in SAS. Intakes of MR and starter did not differ through d 56 (P > 0.17), but group starter intake was greater (P < 0.02) for CTP than CEP or CON. During the pre-weaning period BW was greater (P < 0.04) for CTP, which continued to d 56 and after (P < 0.04). Mean BW at d 91 were 100.9, 112.6, and 107.2 kg for CON, CTP, and CEP. Differences in BW were reflected in similar differences in BL, HW, and HH. The number of times calves were medicated was different among the groups (P < 0.01), with CTP calves being medicated the least (63 times), compared with CON and CEP (144 and 145 times, respectively). Instances of fecal scores > 2 (4-point scale) were lower (P = 0.04) for CTP (366 instances) compared with CON and CEP (463 and 441 instances, respectively). Nasal discharge scores showed a similar pattern among treatments. In conclusion, both feed additive groups showed greater growth than CON, but only CTP improved measures of health.

Key Words: phytogen, yeast product, calf