

Graduate Student Competition: ADSA Production Division Poster Competition, MS Division

T113 Effect of dietary unsaturated fatty acids on ruminal fermentation in dairy cows. J. E. Freitas Jr.*¹, M. D. S. Oliveira², B. C. Venturelli¹, E. F. Jesus², R. Gardinal¹, G. D. Calomeni¹, J. R. Gandra¹, V. G. C. Lacuna¹, V. P. Bettero², C. S. Takiya¹, R. V. Barletta¹, and F. P. Rennó¹, ¹University of São Paulo, Pirassununga, São Paulo, Brazil, ²State University Julio de Mesquita, Jaboticabal, São Paulo, Brazil.

The aim of this study was to evaluate the ruminal fermentation in dairy cows supplemented with unsaturated fatty acids sources. Eight Holstein cows in the mid lactation (80 ± 20 d in milk; mean SD) cannulated in the rumen and abomasums (580 ± 20 kg of weight; mean ± SD) with milk yield of 25 kg/d were assigned randomly into two 4 × 4 Latin squares, fed the following diets: (1) control (C); (2) refined soybean oil (inclusion of 3% in the total dry matter); (OS); (3) whole soybean raw (WS) (inclusion of 16% in the total dry matter); and (4) calcium salts of unsaturated fatty acids (CSFA) (inclusion of 3% in the total dry matter). Data were analyzed using PROC MIXED of SAS 9.1 according with the orthogonal contrasts (C vs SO + WS + CSFA); (SO vs WS + CSFA) and (WS vs CSFA). Dietary treatments did not affect total molar proportions of ruminal volatile FA. However, cows fed WS, SO and CSFA had a slow molar proportion of butyrate than those fed the CO diet. Cows fed SO had a higher ruminal pH than those fed the WS and CSFA diets (5.76; 5.87; 5.78 and 5.76 to diets CO, SO, WS and CSFA respectively). However, cows fed CO had a higher NH₃-N concentration than those fed the WS, SO and CSFA diets (43.1; 36.4; 36.9 and 33.3 mg/dL to diets CO, SO, WS and CSFA respectively). Unsaturated fatty acids increased ruminal molar proportions of acetate and propionate (1.2 and 3.3% respectively) and decreased ruminal molar proportions of butyrate in 10.1%. It is concluded that the supplementation of unsaturated fatty acids, alter ruminal fermentation and have positive effect on ruminal energetic efficiency

Key Words: oil soybean, abomasum, whole soybean

T114 Effects of nutritional prepartum supplementation upon maternal-kid behavior (1). N. E. Hernandez-Macias*¹, V. Contreras-Villarreal¹, O. Angel-Garcia¹, J. M. Guillen-Muñoz¹, P. A. Robles-Trillo¹, G. Arellano-Rodriguez¹, R. Rodriguez-Martinez¹, M. Mellado¹, C. A. Meza-Herrera², and F. G. Veliz¹, ¹Universidad Autonoma Agraria Antonio Narro, Torreon, Coahuila, Mexico, ²URUZA-UACH, Bermejillo, Durango, Mexico.

This study aimed to evaluate the effect of either 15 or 30 d of prepartum nutritional supplementation upon maternal-kids behavior under grazing-semiarid rangeland conditions in northern México (26 N). A total of 23 goats with similar body weight and condition were divided in three experimental groups: (1) Control Group (CG; n = 7) was non-supplemented, (2) G15 Group (G15, n = 8) was supplemented from 15-d pre- up to 7-d postpartum; goats were supplemented prior grazing (0800) with a 500 g of a mixture of 20% manure, 37% rolled corn, 37% bran, 4% treacle and 2% salt); (3) G35 group (G35, n = 8) received the same supplement as G15 but from 35-d pre- up to 7-d postpartum. To evaluate kids' ability to differentiate their mother from an alien kid's at 8 h postkidding, a discrimination test was carried out, which is a double election test to evaluate their preference for his mother. The test lasted 5 min. Recorded behaviors included: high and low bleating

per kid, number of visits to the "Contact Zone" and time spent in each zone. Data were subjected to the Student t-test (MYSTAT). Table 1 shows the behavioral variables considered. No differences ($P < 0.05$) were observed among experimental groups for the studied behavioral doe-kids variables. The last may have occurred because does depicted a intermediate body condition and were facing similar management conditions. Therefore, results suggest that does-kids facing such physiological and environmental scenarios do not require any additional supplementation to enhance or stimulate a closer relationship between does and their kids.

Table 1. Results of the discrimination test performed 8 h after birth

	Events (no.)		Time (min)		High bleating (no)		Low bleating (no.)	
	Own	Alien	Own	Alien	Own	Alien	Own	Alien
CG	0.3±0.2 ^{a,x}	0.3±0.2 ^{a,x}	0.3±0.2 ^{a,x}	0.3±0.2 ^{a,x}	2.1±1.5 ^{a,x}	1.0±0.7 ^{a,x}	0.8±0.8 ^{a,x}	0.2±0.2 ^{a,x}
G15	0.2±0.2 ^{a,x}	0.2±0.2 ^{a,x}	6.2±6.9 ^{a,x}	0.2±0.2 ^{b,x}	1.8±1.9 ^{b,x}	0.4±0.4 ^{a,x}	0.4±0.4 ^{a,x}	0.1±0.1 ^{a,x}
G30	0.8±0.2 ^{b,x}	1.1±0.3 ^{b,x}	19.6±11.2 ^{a,x}	15.7±7.7 ^{b,x}	2.9±0.9 ^{a,x}	2.1±0.7 ^{b,x}	3.4±1.9 ^{a,x}	0.3±0.2 ^{a,x}

^{a,b}Statistical differences between groups at $P < 0.05$.

^{x,y}Statistical differences between own and alien kid at $P < 0.05$.

Key Words: goat, behavior, supplementation

T115 Use of estradiol to induce reproductive activity in anestrus goats. V. Contreras-Villarreal*¹, O. Angel-Garcia¹, J. M. Guillen-Munoz¹, P. A. Robles-Trillo¹, M. A. de Santiago-Miramontes¹, G. Arellano-Rodriguez¹, R. Rodriguez-Martinez¹, M. Mellado¹, C. A. Meza-Herrera², and F. G. Veliz¹, ¹Universidad Autonoma Agraria Antonio Narro, Torreon, Coahuila, Mexico, ²URUZA-UACH, Bermejillo, Durango, Mexico.

Use of estradiol for sexual activity induction was evaluated in anestrus goats. Mixed breed anovulatory adult goats (n=16) were divided into 2 groups (n=8) with homogeneous body condition score and body weight; four mixed-breed bucks were also used. Does grazed from 1000h to 1600h. Group 1 (IM+E2) received 25 mg i.m. progesterone and 24h later received 1 mg i.m. estradiol (estradiol cyclopentil propionate). Group 2 (Spo+E2) was treated during 7 days with an intravaginal sponge impregnated with 20 mg cronolone; at sponge removal, goats received 1 mg i.m. estradiol; does were penned and kept there during 5-d, and were fed with alfalfa hay ad libitum, 200 g commercial mix (14% CP, per animal/d) while trace mineral salt blocks and water ad libitum. Estrus activity was evaluated by introducing a male in each experimental group 15 min (morning) and 15 min (afternoon). Females depicting signs of heat were moved to a different pen with two males. Follicular activity was evaluated with a transrectal ultrasonographic scanning (TUS) from -7 d up to +7 d from estradiol administration. Forty-five days after estrus detection, goats were evaluated for pregnancy by TUS. Number and size of ovulatory follicles and size of the corpus luteum for each group were compared with a Student T; the percentage of females depicting estrus, ovulation and pregnancy were compared with a chi². Reproductive response from both experimental groups is presented on Table 1. Mixed-breed anestrus goats from northern Mexico (26°N) treated with estradiol positively responded to estrus activity induction although depicted a reduced ovulation rate. Therefore, estradiol may have not been able to stimulate follicles enough for oocyte maturation and ovulation.

Table 1. Reproductive response of mixed-breed anestrus goats receiving either an i.m. progesterone or intravaginal sponges impregnated with progesterone and estradiol.

Sexual response	Group	
	IM + E2	Esp + E2
Estrus (n)	8/8 ^a	8/8 ^a
Ovulation (n)	4/8 ^a	5/8 ^a
Pregnancy (n)	3/5 ^a	3/5 ^a
Ovarian follicles (n)	0.63 ± 0.22 ^a	0.88 ± 0.23 ^a
Ovarian follicles size (mm)	0.8 ± 0.03 ^a	0.8 ± 0.03 ^a
Corpus luteum size (mm)	0.825 ± 0.07 ^a	0.762 ± 0.26 ^b

^{a,b}Different superscript within variables denote differences $P < 0.05$.

Key Words: estradiol, anestrus, goat

T116 Effects of nutritional prepartum supplementation upon maternal-kid behavior (2). N. E. Hernandez-Macias^{*1}, V. Contreras-Villarreal¹, O. Angel-Garcia¹, J. M. Guillen-Munoz¹, P. A. Robles-Trillo¹, G. Arellano-Rodriguez¹, R. Rodriguez-Martinez¹, M. Mellado¹, C. A. Meza-Herrera², and F. G. Veliz¹, ¹Universidad Autonoma Agraria Antonio Narro, Torreon, Coahuila, Mexico, ²URUZA-UACH, Bermejillo, Durango, Mexico.

This study aimed to evaluate the effect of either 15 or 30 d of prepartum nutritional supplementation upon maternal-kids behavior under grazing-semiarid rangeland conditions in northern México (26°N). A total of 23 goats with similar body weight and condition were divided in three experimental groups: (1) Control Group (CG; n = 7) was non-supplemented, (2) G15 Group (G15, n = 8) was supplemented from 15-d pre- up to 7-d post-partum; goats were supplemented prior grazing (0800) with a 500 g of a mixture of 20% manure, 37% rolled corn, 37% bran, 4% treacle and 2% salt); (3) G35 group (G30, n = 8) received the same supplement as G15 but from 30-d pre- up to 7-d postpartum. To evaluate mother ability to differentiate their kids from an alien at 4h postpartum, a Discrimination Test was carried out, which is a double election test to evaluate their preference for her kid. The test lasted 5 min. Recorded behaviors included: high and low bleating per mother, number of visits to the "Contact Zone" and time spent in each zone. Data were subjected to the Student t-test. Table 1 shows the behavioral variables considered. No differences ($P < 0.05$) were observed among experimental groups for the studied behavioral doe-kids variables. The last may have occurred because does depicted a intermediate body condition and were facing similar management conditions. Therefore, results suggest that does-kids facing such physiological and environmental scenarios do not require any additional supplementation to enhance or stimulate a closer relationship between does and their kids.

Table 1. Results of the discrimination test realized to the mothers at 4 h postpartum.

Group	Events (no.)		Time (min)		High bleating (no)		Low bleating (no.)	
	Own	Alien	Own	Alien	Own	Alien	Own	Alien
	CG	1.0±0.4 ^{a,x}	0.9±0.3 ^{a,x}	40.7±19.5 ^{a,x}	57.3±36.5 ^{a,x}	3.8±1.9 ^{a,x}	3.0±1.5 ^{a,x}	15.8±6.8 ^{a,x}
G15	0.7±0.5 ^{a,x}	0.4±0.3 ^{a,x}	9.7±4.9 ^{b,x}	6.0±3.7 ^{b,x}	2.6±2.5 ^{a,x}	3.3±3.0 ^{b,x}	1.8±1.2 ^{a,x}	1.5±1.1 ^{b,x}
G30	1.3±0.5 ^{a,x}	0.9±0.2 ^{a,x}	25.1±11.5 ^{b,x}	11.9±5.9 ^{b,x}	8.6±4.0 ^{a,x}	4.6±2.3 ^{a,x}	6.3±2.8 ^{a,x}	4.4±2.0 ^{b,x}

^{a,b}Statistical differences between groups at $P < 0.05$.

^{x,y}Statistical differences between own and alien kid at $P < 0.05$.

Key Words: goat, behavior, supplementation

T117 Effects of tamoxifen on estrogen and progesterone receptor expression in prepubertal female calves. H. L. M. Tucker^{*1}, C. L. M. Parsons¹, S. Ellis², and R. M. Akers¹, ¹Dairy Science Department, Virginia Polytechnic Institute and State University, Blacksburg, ²Animal and Veterinary Sciences Department, Clemson University, Clemson, SC.

We have reported that ovariectomy (OVX) of prepubertal calves reduces mammary development in the period before puberty would have occurred. This was accompanied by increases in expression of estrogen receptor (ER), IGF-I axis molecules and expression of extracellular matrix proteins. Our purpose was to determine if the effects of OVX were dependent on expression of estrogen and/or progesterone (PR) receptors by use of the anti-estrogen tamoxifen. Sixteen Holstein calves were randomly assigned to one of two treatment groups: tamoxifen-injected (TAM) or control (CON). Calves were injected daily from 28 d to 120 d of age with 0.3 mg/kg tamoxifen or carrier. At 120 days calves were sacrificed and udders removed. Weight of trimmed parenchymal tissue (left rear quarter) was dramatically lower ($P < 0.0003$; 16.1 vs. 34.8 g) in TAM calves. Parenchymal samples from three regions of the left rear quarter (lower, middle and outer regions) were processed for immunohistochemical staining for ER and PR. Ductal areas within parenchymal sections were identified as stratified or unstratified. Epithelial cells were classified as ER positive, PR positive, dual labeled or unlabeled. The orientation of labeled cells was also characterized based on position within the epithelial layer (luminal, medial, or basal). Overall, the proportion of neither ER nor PR labeled cells was impacted by treatment but the percentage of dual labeled cells was higher (38.4% vs. 34.1%) in CON calves ($P < 0.05$). However, imaging analysis indicated a markedly higher intensity of ER expression in CON calves but no difference for PR staining intensity. The proportion of both ER and PR labeled cells was different when comparing stratified vs. unstratified ductal regions ($P \leq 0.001$). While treatment with the anti-estrogen tamoxifen reduced mammary parenchymal mass similarly to OVX, the mechanism(s) involved appear to differ. This suggests that the impacts of ovariectomy are only partially explained by alterations in ER expression. Ongoing analysis is focused on determining intensity of ER expression as well as effects of tamoxifen on other mammogenic pathways.

Key Words: tamoxifen, ovariectomy, estrogen receptor

T118 Effect of fatty acids n-3 and n-6 supplementation on blood parameters of Holstein cows during transition period and early lactation. R. Gardinal^{*1}, J. R. Gandra¹, G. D. Calomeni¹, L. C. Verdurico¹, R. D. Mingoti¹, R. V. Barletta¹, J. E. Freitas Jr.¹, C. E. Araújo¹, T. H. A. Vendramini¹, E. Ferreira de Jesus², and F. P. Rennó¹, ¹Department of Nutrition and Animal Production, Faculty of Veterinary Medicine, University of São Paulo, Pirassununga, São Paulo, Brazil, ²Department of Animal Science, State University Julio de Mesquita UNESP, Jaboticabal, Jaboticabal, São Paulo, Brazil.

The aim of this study was to evaluate effect of n-3 and n-6 supplementation on blood parameters of Holstein cows during transition period and early lactation. Forty-eight Holstein cows were divided in 4 experimental groups in randomized design. Animals were assigned to receive 1 of 4 treatments: (1) control (C; n = 12), without fat sources in pre and postpartum; (2) flaxseed (FS; n = 12), fed 60 and 80 g/kg of DM of flaxseed in pre and postpartum; (3) whole raw soybeans (WS; n = 12), fed 120 and 160 g/kg of DM of whole raw soybeans in pre and postpartum; (4) calcium salts of unsaturated fatty acids (CSFA; n = 12; Megalac-E), fed 24 and 32 g/kg of DM of calcium salts of unsaturated fatty acids in pre and postpartum. Experimental diets were fed from 35 d before the estimate calving until 84 d of lactation, formulated to meet nutritional requirements of each period. Blood samples were

taken -21, -14, -7 days in relation to prediction of birth, at birth and +7, +14, +21, +28, +35, +42, +84 days postpartum. Glucose (GLU), total cholesterol (CHOL), triacylglycerides (TRI), non-esterified fatty acids and β -hydroxybutyrate concentrations were measured. Data were analyzed using the PROC MIXED of SAS 9.1 with fixed dietary effect, time effect, interaction between diet and time. Data were analyzed by orthogonal contrasts C vs. WS+CSFA+FS (C1); FS vs. WS+CSFA (C2); and WS vs. CSFA (C3). In the prepartum, animals supplemented with fatty acids had higher ($P < 0.05$) concentration of TRI (C1) (25.0 vs. 40.4, respectively). Concentration of GLU was higher ($P < 0.05$) in group FS, C2 (70.7 vs. 62.4, respectively). WS group had higher concentration ($P < 0.05$) of CHOL compared to CSFA group (C3) (137.9 vs. 103.1, respectively). In the postpartum, animals supplemented with fatty acids had higher ($P < 0.05$) concentration of CHOL (C1) (142.0 vs. 165.1, respectively). Concentration of GLU was higher ($P < 0.05$) in group FS (C2) (67.2 vs. 58.4, respectively). Blood parameters of Holstein cows fed with source of n-3 and n-6 in the transition period and early lactation were positively influenced.

Key Words: fat source, blood parameter, transition period

T119 Ruminal dynamics and neutral detergent fiber digestibility of dairy cows fed with different sources of unsaturated fatty acids. R. Gardinal*¹, J. E. Freitas Jr.¹, M. D. S. Oliveira², B. C. Venturelli¹, E. F. Jesus², G. D. Calomeni¹, L. C. Verdurico¹, V. G. C. Lacuna¹, V. P. Bettero², T. H. A. Vendramini¹, R. V. Barletta¹, and F. P. Rennó¹, ¹Department of Nutrition and Animal Production, Faculty of Veterinary Medicine, University of São Paulo, Pirassununga, São Paulo, Brazil, ²Department of Animal Science, State University Julio de Mesquita – UNESP Jaboticabal, Jaboticabal, São Paulo, Brazil.

The aim of this study was to evaluate the ruminal dynamics, NDF concentrations and digestibility of dairy cows fed with different sources of unsaturated fatty acids. Eight Holstein cows in mid-lactation (80 ± 20 d in milk, mean SD) cannulated in the rumen and abomasums (580 ± 20 kg of weight, mean \pm SD) with milk yield of 25 kg/d were randomly assigned into two 4×4 Latin squares, fed the following diets: (1) control (C); (2) refined soybean oil (inclusion of 3% in the total dry matter); (SO); (3) whole raw soybean (WS) (inclusion of 16% in the total dry matter); and (4) calcium salts of unsaturated fatty acids (CSFA) (inclusion of 3% in the total dry matter). Milk yield and dry matter intake were measured daily throughout the experimental period. The marker NDFi was used to determine the abomasal dry matter flow. Ruminal contents were evacuated manually through the ruminal cannula at 4.5 h after feeding on d 20, and at 2.0 h before feeding on d 21 of each period. Fractional rates of fatty acids biohydrogenation and passage by the rumen were calculated utilizing the model that accounts for transfer of fatty acids among ruminal pools. The potentially digestible neutral detergent fiber (pdNDF) was calculated by the difference ($1.0 - \text{NDFi}$). Data were analyzed using PROC MIXED of SAS 9.1 according with the orthogonal contrasts (C vs. SO + WS + CSFA) (SO vs. WS + CSFA) and (WS vs. CSFA). Animals fed with WS diet showed higher NDF intake ($P < 0.05$) than those fed with CSFA diet (5.25 vs. 4.65 kg/d, respectively). There was a lower pdNDF intake ($P < 0.05$) by the animals fed with WS diet relative to the animals fed with CSFA diet (2.41 vs. 2.70 kg/day, respectively). The cows fed with C diet had lower ruminal digestibility of pdNDF ($P < 0.05$) compared to the cows fed with SO, WS and CSFA diets, contrast one (1.41 vs. 1.79; 2.02; 1.88, respectively). The use of diets containing raw soybean and calcium salts provided better ruminal digestibility of pdNDF (kg/d) in dairy cows in mid-lactation.

Key Words: linoleic acid, whole raw soybean, ruminal fermentation

T120 Follicular dynamics of Holstein cows fed with supplemental sources of n-3 and n-6 fatty acids during transition period and early lactation. G. D. Calomeni*¹, J. R. Gandra¹, R. Gardinal¹, J. E. Freitas Jr.¹, L. C. Verdurico¹, E.F. Jesus², C.S. Takiya¹, R.D. Mingotti¹, T. H. A. Vendramini¹, R. V. Barletta¹, and F. P. Rennó¹, ¹Department of Nutrition and Animal Production, Faculty of Veterinary Medicine, University of São Paulo, Pirassununga, São Paulo, Brazil, ²Department of Animal Science, State University Julio de Mesquita – UNESP Jaboticabal, Jaboticabal, São Paulo, Brazil.

The aim of this study was to evaluate the effect of supplemental sources of n-3 and n-6 fatty acids in follicular dynamics of dairy cows fed during the transition period and early lactation. Forty-eight Holstein cows were assigned into 4 experimental groups in randomized designed. The animals were randomly assigned to receive one of 4 treatments: (1) control (C), without fat sources in the pre and postpartum, (2) flaxseed (FS), 60 and 90 g/kg of DM of flaxseed in the pre and postpartum, respectively; (3) whole raw soybeans (WS), 120 and 160 g/kg of DM of whole raw soybeans in the pre and postpartum; (4) calcium salts of unsaturated fatty acid (CFSA; Megalac-E), 24 and 32 g/kg of DM of calcium salts of unsaturated fatty acid in pre and postpartum. The experimental diets were fed from 35 d before the estimate calving, and provided until 84 d of lactation, formulated to meet the nutritional requirements of each period. Ovaries of all cows were examined daily by ultrasonography beginning on day 14 and continuing until day 72 postpartum. Were examined by scanning: the total number of follicles (TNF), size of follicles, number and area (mm²) of corpus luteum. Follicles were classified by size into 5 classes: (1) <3mm (CLA1), (2) 3-5mm (CLA2), (3) 6-9 mm (CLA3), (4) 10-15 mm (CLA4) and (5) >15 mm (CLA5). Data were analyzed using PROC MIXED of SAS 9.1, with the effect of treatment, period and interaction as fixed effects, and animal has random effect. The data were analyzed by orthogonal contrasts C vs. WS+CSFA+FS (C1); WS vs. CSFA (C2); and FS vs. WS+CFSA (C3). We observed an effect ($P < 0.05$) of treatment only for TNF and number of CLA1. Effect of period was observed for TNF, number of CLA3 and CLA5. There was interaction ($P < 0.05$) between the fatty acids sources and period for TNF, number of CLA2 e CLA3. Analyzing the orthogonal contrasts effect of C1 was observed for TNF (10.4 vs. 14.5) and number of CLA1 (1.27 vs. 4.21). The supplemental sources of n-3 and n-6 fatty acids influenced follicular dynamics of dairy cows fed during transition period and early lactation.

Key Words: fat source, follicular dynamics, transition period

T121 Ruminal dynamics of dairy cows fed with different sources of unsaturated fatty acids. G. D. Calomeni*¹, J. E. Freitas Jr.¹, R. Gardinal¹, M. D. S. Oliveira², B. C. Venturelli¹, E. F. Jesus², C. S. Takiya¹, V. G. C. Lacuna¹, V. P. Bettero², T. H. A. Vendramini¹, R. D. Mingoti¹, F. Zanferrari¹, R. V. Barletta¹, and F. P. Rennó¹, ¹Department of Nutrition and Animal Production, Faculty of Veterinary Medicine, University of São Paulo, Pirassununga, São Paulo, Brazil, ²Department of Animal Science, State University Julio de Mesquita – UNESP Jaboticabal, Jaboticabal, São Paulo, Brazil.

The aim of this study was to evaluate the ruminal dynamics of dairy cows fed with sources of unsaturated fatty acids. Eight Holstein cows in the mid lactation (80 ± 20 d in milk; mean SD) cannulated in the rumen and abomasums (580 ± 20 kg of weight; mean \pm SD) with milk yield of 25 kg/d were assigned randomly into two 4×4 Latin squares, fed the following diets: (1) control (C); (2) refined soybean oil (inclusion of 3% in the total dry matter); (OS); (3) whole soybean raw (WS) (inclusion of 16% in the total dry matter); and (4) calcium salts of unsaturated fatty acids (CSFA) (inclusion of 3% in the total dry matter). Milk yield and the dry matter intake were measured daily throughout the experimental

period. The marker iNDF was used to determine the abomasal dry matter flow. Ruminal contents were evacuated manually through the ruminal cannula at 4.5 h after feeding on d 20, and at 2.5 h before feeding on d 21 of each period. Turnover rate in the rumen, passage rate from the rumen, and ruminal digestion rate of each component (%/h) were calculated. Data were analyzed using PROC MIXED of SAS 9.1 according with the orthogonal contrasts (C vs. SO + WS + CSFA); (SO vs. WS + CSFA) and (WS vs. CSFA). There was no effect of unsaturated fatty acids sources on dry matter and NDF digestions rates. Although, cows fed with WS diet submitted lower ($P < 0.03$) digestion rate of potentially digestible NDF (pdDNF) than cows fed with CFSA diet (1.21; 1.30; 0.89; 1.34%/h, to diets CO, SO, WS and CSFA respectively). Ruminal turnover rate for pdNDF ($P < 0.01$) was greater for animals fed the WS diet than did cows fed the CFSA diet (2.13; 2.48; 2.82; 1.91%/h, to diets CO, SO, WS and CSFA respectively). There was no effect of the diets on the passage rate, ruminal turnover rates of dry matter, organic matter, NDF and iNDF and rate of passage of dry matter, NDF, and iNDF. The supplementation of unsaturated fatty acids alter the ruminal dynamics of dairy cows

Key Words: ruminal turnover rate, dairy cow, unsaturated fatty acids

T122 Effect of different fatty acid profiles on milk fat depression in dairy cattle fed diets below 4% fat. C. M. Stoffel* and L. E. Armentano, *Department of Dairy Science, University of Wisconsin-Madison, Madison.*

High dietary C18:2 (linoleic acid) levels can result in incomplete biohydrogenation of fatty acids (FA) in the rumen leading to reduced milk fat secretion. The goal of this study was to identify the effect of different dietary FA profiles at FA levels below 4% of TMR dry matter (DM). Twenty-four primiparous and 36 multiparous lactating cows were paired (within parity) to form 30 experimental units. Pairs were fed 6 diets in five 6 × 6 balanced Latin squares with 21-d periods, using data from the last 5 d. There were two control diets: a corn control diet (CC; 29% corn silage, 16% haylage, 19% corn grain, 8% distillers grain, DM basis) containing 3% ether extract; and a low oil control (LOC; 9% corn silage, 35% haylage, 20% corn starch, and 8% corn gluten meal, DM basis) containing 2% ether extract. Starch in LOC was replaced with 1.75% diet DM of a 50/50 blend of corn oil and high linoleic safflower oil (CO), high oleic sunflower oil (OO), palm oil (PO), or 1.84% diet DM MegaLac (ML, Church and Dwight Company, Inc., Princeton, NJ) to create 4 treatment diets. Milk fat yield and concentration was significantly lower for CO than for PO. Milk yield was significantly lower for LOC than all other diets except ML. There were no treatment by parity or treatment by production effects on any of these parameters. The underperformance of the LOC versus the other diets suggests that it is useful to feed some fat in the diet. However, while adding free oils to the LOC diet increased milk yield, only palm oil increased milk fat yield.

Table 1.

Item	CC	LOC	CO	OO	PO	ML
C18:2 from oil, %						
Diet DM	—	—	1.15	0.18	0.16	0.11
Milk, kg/d	43.5 ^{ab}	39.7 ^c	42.7 ^{ab}	43.1 ^{ab}	43.5 ^a	40.7 ^{bc}
Fat, kg/d	1.49 ^a	1.38 ^{ab}	1.29 ^c	1.38 ^{ab}	1.48 ^a	1.39 ^{ab}
Fat, %	3.50 ^a	3.50 ^a	3.02 ^c	3.26 ^{ab}	3.41 ^a	3.44 ^a
Protein, kg/d	1.36 ^a	1.26 ^b	1.33 ^{ab}	1.34 ^{ab}	1.35 ^a	1.25 ^b

^{a-c}Means in a row with different superscripts differ ($P < 0.05$, Tukey-Kramer post hoc comparisons).

Key Words: fatty acid, milk fat depression, biohydrogenation

T123 Increasing dietary cation-anion difference improves feed efficiency in lactating dairy cows. M. E. Iwaniuk* and R. A. Erdman, *University of Maryland, College Park.*

Feed costs in the dairy industry have doubled during the last five years and dairy producers are keenly interested in factors that will improve dairy feed efficiency (FE). The most common index of dairy FE is 3.5% fat-corrected milk (FCM) per unit of dry matter intake (DMI). Increasing dietary cation-anion differences (DCAD) has been shown to increase milk production, FCM, and FE while optimizing DMI. However, the optimal DCAD concentration for maximum production and dairy FE has yet to be determined. The objective of this experiment was to determine the optimal DCAD concentration for maximal FE in early lactation dairy cows. Eight primiparous and 12 multiparous Holstein cows averaging 89 (± 25) days in milk were used. Cows were individually fed a basal diet consisting of 60% corn silage and 40% concentrate (dry matter basis). Experimental treatments consisted of 250 (basal), 300, 350, and 400 mEq/kg DCAD which were applied in a 4 × 4 Latin square design with 3-week experimental periods. Potassium carbonate was added to the basal diet to provide the respective DCAD concentrations. DCAD had no effect on milk production or DMI. However, milk fat percent was increased linearly ($P = 0.014$) by DCAD resulting in an increased ($P = 0.054$) FCM. This resulted in a 0.08 unit increase in dairy FE ($P = 0.027$). As the maximum FE occurred at the highest DCAD concentration, the optimal DCAD could not be determined, but it would be at least 400 mEq/kg DM. The results confirm earlier studies suggesting that altering DCAD could be used to increase FE in dairy cows and reduce feed costs.

Table 1.

Item	DCAD, mEq/kg				SEM	$P <$	
	250	300	350	400		Linear	Quadratic
Milk, kg/d	38.9	38.4	39.2	38.7	1.560	0.943	0.917
Fat, %	2.58	2.82	2.75	2.89	0.179	0.014	0.529
3.5% FCM, kg/d	32.8	33.7	34.3	34.7	1.410	0.054	0.745
DMI, kg/d	21.7	22.1	22.3	22.0	0.500	0.247	0.156
FCM/DMI	1.52	1.54	1.54	1.60	0.510	0.027	0.350

Key Words: dairy cow, DCAD, potassium carbonate

T124 Sodium bicarbonate is more effective than potassium carbonate as a DCAD source for improving feed efficiency in lactating dairy cows. M. E. Iwaniuk* and R. A. Erdman, *University of Maryland, College Park.*

Increasing dietary cation-anion differences (DCAD) has been shown to increase milk production (MP), 3.5% fat-corrected milk (FCM), and feed efficiency (FE) while optimizing dry matter intake (DMI) in lactating dairy cows. Either sodium (Na) or potassium (K) can be used to increase DCAD in lactating dairy cow diets; however, cation supplementation with potassium carbonate (K_2CO_3) is 4× more expensive than cation supplementation with sodium bicarbonate ($NaHCO_3$). The objective of this study was to determine the relative efficacy of K_2CO_3 versus $NaHCO_3$ on dairy FE. Eight primiparous and 12 multiparous Holstein cows averaging 95 (± 75) days in milk were used. Cows were individually fed a basal diet consisting of 65% corn silage and 35% concentrate (dry matter basis). Experimental treatments consisted of a basal diet containing 250 mEq/kg DCAD, and the addition of 150 mEq/kg DCAD using four ratios (mEq/kg basis) of K:Na: 100:0, 67:33, 33:67, and 0:100 using K_2CO_3 and $NaHCO_3$, respectively. Treatments were applied in a 4 × 4 Latin square design with 3-wk experimental periods. Cation source had no effect on DMI, MP, or FCM production. However, cation source had

a significant effect on milk fat where replacement of K with Na resulted in a linear increase in milk fat percent ($P = 0.005$). Dairy FE, defined as FCM/DMI, was highest ($P = 0.04$) when Na was the sole cation source. This change was primarily a result of increased milk fat percent that increased FCM. These results suggest that Na was more effective than K as a cation supplement to improve dairy FE.

Table 1.

Item	K:Na ¹				SEM	$P <$	
	100:0	67:33	33:67	0:100		Linear	Quadratic
Milk, kg/d	37.5	37.3	36.3	37.9	1.280	0.903	0.219
Fat, %	3.06	3.20	3.20	3.36	0.169	0.005	0.885
3.5% FCM, kg/d	34.6	35.2	34.3	36.7	1.060	0.132	0.262
DMI, kg/d	22.3	22.3	22.1	22.0	0.460	0.598	0.851
FCM/DMI	1.56	1.58	1.55	1.67	0.040	0.036	0.125

¹All diets contained an overall DCAD concentration of approximately 400 mEq/kg.

Key Words: dairy cow, DCAD, feed efficiency

T125 Quality of corn silage inoculated with *L. buchneri* and *P. pentosaceus*. K. N. Kaletsch^{*1}, S. H. Ward¹, J. K. Ward², J. D. Davis², and A. J. Geiger¹, ¹Department of Animal and Dairy Sciences, Mississippi State, ²Department of Agriculture and Biological Engineering, Mississippi State.

Corn was harvested on July 21–22, 2012, using a 1.9-cm forage chopper with kernel processor. Corn was 35% DM and treated with 5×10^5 cfu/g of *Lactobacillus buchneri* and *Pediococcus pentosaceus* (B500) or not (CON). Treatment was applied as silage was loaded into bags using a Kelly Ryan Bagger with a 2.74 m tunnel. 22,959 and 25,290 kg of wet silage was loaded into CON and B500 bag, respectively. Temperature sensors were placed in the bags and data was logged every 4 h for 120 d. Samples were collected every 6 h for 48 h, every 24 h for 5 d, then weekly for 5 wk, and again at 90 and 120 d. Samples were analyzed for pH then subjected to proximate analysis. Samples were pooled by week (1–6), 90 and 120 d, analyzed for mold and mycotoxins. MIXED procedure of SAS (Cary, NC) was used to analyze the main effects of treatment, day, and their interaction. Significance was declared at $P < 0.05$. Interaction of treatment and day was significant for all measures of proximate analysis and pH. DM was lower in B500 compared to CON (39.1 vs. 40.2%, respectively; $P < 0.01$). DM increased in CON from 40% on d 60 to 45% on d120 and decreased in B500 from 35% on d 60 to 25% on d120. Ash content was greater in CON compared to B500 (5.0 vs. 4.9%, respectively; $P < 0.04$). IVDMD was greater in CON compared to B500 (72.7 vs. 60.9%, respectively, $P < 0.01$). On d7, 8, and 50 CON had greater NDF (53.6, 52.3, 52.7%, respectively) and ADF (25.9, 29.3, 28.8%, respectively) than B500 (NDF: 43.5, 50.1, 46.9%, respectively; ADF: 17.1, 24.3, 27.3%; respectively; $P < 0.01$), otherwise B500 had greater NDF and ADF content. CP was lower in B500 than CON on d7, 40, and 50 (7.0 vs. 7.3%; 7.5 vs. 7.8%; 8.5 vs. 9.6%; respectively, $P < 0.01$), but greater on other days. In 24h, pH of CON decreased faster compared to B500 (4.5 to 3.9 vs. 3.9 to 3.8, respectively; $P < 0.01$). B500 had lower pH on d1, but the reverse was observed in subsequent days. Greater spoilage was noted in B500 as time progressed. Mold count exceeded 6×10^6 cfu/g by d 120 in B500 compared to CON ($< 50,000$ cfu/g). Inoculation was more effective in nutrient preservation than CON, but after d60 data indicated increased spoilage of inoculated silage.

Key Words: silage, inoculant, dairy

T126 Effect of stocking density in the prepartum period on innate immune parameters and hemogram of dairy cows. A. Dresch^{*1}, J. Moraes¹, P. Silva², H. Hooper¹, C. Spies¹, P. Lau¹, K. Lobeck², K. Machado¹, M. Ballou³, M. Endres², and R. Chebel¹, ¹Department of Veterinary Population Medicine, University of Minnesota, St Paul, ²Department of Animal Science, University of Minnesota, St Paul, ³Department of Food and Animal Sciences, Texas Tech University, Lubbock.

Objectives were to evaluate the effect of prepartum stocking density on innate immune parameters and hemogram of Jersey cows. Within each replicate ($n = 4$), 2 pens were assigned to 80% stocking density (80D, $n=38$) and 2 pens were assigned to 100% stocking density (100D, $n=48$). Nulliparous and parous animals were housed separately. Pen was considered the experimental unit ($n=8$ /treatment). A sub-sample of animals randomly selected to represent each pen ($n=48$ /treatment) had blood sampled weekly from 14 d prepartum to 14 d postpartum. Polymorphonuclear leukocyte (PMNL) phagocytosis (PHAGO) and oxidative burst (OB) and expression of CD18 and L-selectin were determined by flow cytometry, and complete blood count was performed. Animals were examined for metritis at 4, 7, 10, and 14 d postpartum. Dichotomous data were analyzed by logistic regression using the PROC GLIMMIX and continuous data were analyzed by ANOVA using the PROC MIXED procedure. Pen was included as the random effect. Treatment was nested within pen and replicate and cows were nested within treatment. Stocking densities were 74.0 and 94.3% (± 0.3) of headlocks and 80.7 and 102.8% (± 0.4) of stalls for 80D and 100D, respectively. The incidence of metritis was 33.3 and 11.8% for nulliparous animals and 16.7 and 22.2% for parous animals in the 80D and 100D treatments, respectively. Treatment did not affect percentage of PMNL PHAGO+ ($P = 0.71$) and the intensity of PHAGO ($P = 0.79$). Similarly, treatment did not affect percentage of PMNL OB+ ($P = 0.84$) and intensity of OB ($P = 0.84$). Treatment tended to affect percentage of PMNL CD18+ (80D = 98.8 ± 0.3 vs. 100D = $99.5 \pm 0.3\%$; $P = 0.12$). Intensity of CD18 expression by PMNL, however, was not affected by treatment ($P = 0.47$). Percentage of PMNL L-selectin+ was not ($P = 0.93$) affected by treatment. Similarly, intensity of L-selectin expression by PMNL was not ($P = 0.66$) affected by treatment. The ratio of granulocyte:lymphocyte was not ($P = 0.96$) affected by treatment. Stocking density did not affect innate immune parameters, indicating that 100% stocking density during the prepartum period may not affect health of dairy cows.

Key Words: stocking density, dairy cow, immune response

T127 Effects of residual feed intake classification on feed efficiency, ultrasound, and feeding behavior traits in growing Santa Gertrudis heifers. J. A. Ramirez^{*1}, G. E. Carstens¹, J. G. Moreno¹, L. O. Tedeschi¹, J. C. Bailey¹, J. Jorgenson², and D. D. DeLaney², ¹Texas A&M University, College Station, ²King Ranch, Kingsville, TX.

Objectives of this study were to evaluate the effects of residual feed intake (RFI) classification on performance, efficiency, carcass ultrasound and feeding behavior traits in growing heifers. Santa Gertrudis heifers ($n = 220$) with initial BW of 282.3 ± 98 kg were used in this study. Feed intake and feeding behavior traits were collected for 70 d using a GrowSafe system while consuming a forage-based diet (ME = 2.04 Mcal/kg DM). RFI was computed by regression of DMI on mid-test BW^{0.75} and ADG, and heifers classified into low and high RFI (± 0.05 SD) groups. A 2-population distribution model was fit to \log_{10} -transformed non-feeding interval lengths to estimate meal criterion (MC) and compute frequency and duration. RFI was positively correlated ($P < 0.001$) with DMI ($r = 0.77$) and F:G ($r = 0.68$), but not with initial BW or ADG. RFI was positively correlated ($P < 0.05$) with bunk visit

(BV) frequency ($r = 0.50$) and duration ($r = 0.44$), and meal frequency ($r = 0.13$) duration (0.32). RFI was negatively correlated with meal criterion ($r = -0.33$). The R^2 of the base RFI model (ADG, mid-test $BW^{0.75}$) was 0.42, which increased to 0.65 with the inclusion of feeding behavior traits (BV frequency and duration, MC, meal frequency and duration). Low RFI heifers had 25 and 26% lower ($P < 0.0001$) DMI and F:G compared to high RFI heifers. Heifers with low RFI had lesser ($P < 0.001$) BV frequency (60.5 vs. 75.4 ± 1.7 events/d) and duration (80.2 vs. 99.5 ± 4.1 min/d) and higher ($P < 0.01$) MC (11.65 vs. $9.45 \pm$

0.61 min) compared to high-RFI heifers. Between-animal variation in RFI was not associated with differences in ultrasound measurements of carcass composition in this study. However, variation in feeding behavior traits account for 23% additional variance in DMI beyond that associated with ADG and mid-test $BW^{0.75}$. The longer MC observed in low-RFI heifers suggests that these heifers take longer to initiate a subsequent meal compared to high-RFI heifers, and demonstrate the heifers with divergent RFI have distinctive feeding behavior patterns.

Key Words: feeding behavior, residual feed intake