Small Ruminant

112 Effect of protected dietary oils on dry matter intake, nutrient digestibility, and milk production in dairy goats. E. Vargas-Bello-Pérez1, R. Ayala-Hernández2, N. Pescador-Salas2, O. Castelán-Ortega2, and M. González-Ronquillo1, 1Department of Veterinary and Animal Sciences, Faculty of Health and Medical Sciences, University of Copenhagen, Frederiksberg C, Denmark, 2Facultad de Medicina Veterinaria y Zootecnia, Instituto Literario 100, Universidad Autónoma del Estado de México, Toluca, Estado de México, México.

This study evaluated the effect of protected dietary oils on dry matter intake (DMI), digestibility and milk production in dairy goats. Nine Saanen goats with 150 d in milk were blocked by live weight (LW; 59 ± 4 kg) and used in a 3 × 3 Latin square design (n = 3) with 25-d periods and were kept in individual pens. Periods consisted of 17 of diet adaptation and 8 d of data collection. A basal diet based on barley hay and corn silage was supplemented with 2.7% DM of calcium soaps of either palm (PO), canola (CO) or safflower (SO) oils. Goats were milked daily at 0700h, and milk yield was recorded daily in all experimental periods. Data for LW, dry matter intake (DMI), nutrient digestibility and milk production was analyzed using the MIXED procedure of SAS. Sums of squares from the data were separated into overall mean, goat (within square), square, period, diet, and overall error. All variables were considered random. DMI was high-

Key Words: goat, oils, milk

113 Effect of dietary inclusion of sunflower seed silage (Helianthus annuus) on physical and sensory characteristics of sheep cheese. A. C. Narvaez-López1, L. E. Robles-Jiménez2, E. Cardoso-Gutiérrez1, M. d. I. A. Colín-Cruz1, M. González-Ronquillo1, and E. Vargas-Bello-Pérez2, 1Facultad de Medicina Veterinaria y Zootecnia, Instituto Literario 100, Universidad Autónoma del Estado de México, Toluca, Estado de México, México, 2Department of Veterinary and Animal Sciences, Faculty of Health and Medical Sciences, University of Copenhagen, Frederiksberg C, Denmark.

The objective of this study was to evaluate the physical and sensory characteristics of cheeses from sheep supplemented with sunflower seed silage (SFS). Six East Frisian ewes were used in a 3 × 3 Latin square design during 3 periods of 20 d. At the beginning of the study animals were 70 ± 5 d in milk. Animals were kept in individual pens. Experimental periods consisted of 15 d for diet adaptation and the last 5 d for milk collection. Animals received a control diet (25%DM corn silage, 25%DM alfalfa hay, 50%DM concentrate), and supplemented diets with whole sunflower seed (SF; 5%DM) or SFS (5%DM). Two cheeses per period per treatment (1 kg/each) were manufactured and allowed to ripen for 180 d. After ripening times, an acceptance test was performed with a panel composed of 50 untrained judges. Evaluations on odor, color, texture, taste and overall acceptability were performed. Data were analyzed in a completely randomized design using GLM procedure form SAS. No differences were observed in odor (3.08 ± 0.20), color (3.46 ± 0.38) and texture (3.31 ± 0.58). Scores for taste were higher (P < 0.001) in SF and overall acceptability was lower (P < 0.001) in SFS. Compared with control, pH was lower (P < 0.05) in SFS (5.31 ± 0.03 vs. 5.48 ± 0.06). Lightness (L*; 71.0 ± 2.27), redness (a*; −0.79 ± 0.78), yellowness (b*; 20.9 ± 1.04), chroma (C*; 20.96 ± 0.75) and hue (H*; 92.3 ± 2.15) were similar between treatments (P > 0.05). Counts for mesophiles, coliforms, fungi and yeasts were similar between treatments (P > 0.05). Results showed that SFS decreases overall acceptability of ripened cheeses without detrimental effects on color and microorganism presence.

Key Words: sheep, cheese, sunflower

114 Effect of dietary neutral detergent fiber on mid-infrared predicted milk constituents of non-traditional dairy sheep breeds milked on an accelerated lambing system. N. Kochendoerfer*, M. L. Thonney, and D. M. Barbano, Cornell University, Ithaca, NY.

The effect of replacing dietary NFC with highly digestible NFC from soy hulls (SH) on milk constituents of Finnsheep × Dorset ewes (n = 53) was tested in short and frequent 73-d lactations. The experiment was a triply replicated Latin square (3 ewe groups each with 3 pens of 4–6 animals per pen, 3 lactations, 3 diets). The diets (L-SH, M-SH, H-SH) contained 31.7, 36.3, 40.0% aNDFom and 41.3, 37.2, 31.9% NFC, respectively. Milk was weighed at each 2X milking and -9 weekly samples across each of the 127 lactations were collected and refrigerated until analyzed. The 1170 samples were analyzed with a Fourier transform mid-infrared spectrophotometer and validated with Mojonnier ether extract, Kjeldahl, and MUN reference chemistry. Milk yield and component concentrations were regressed on DIM to obtain average concentrations for each individual lactation. The resulting data were analyzed using a model that included Square Number, Pen and Lactation within Square Number, and Diet. True protein, fat, and lactose concentrations, with means of 5.28 ± 0.05, 5.91 ± 0.09, and 4.81 ± 0.08, respectively, were not significantly affected by level of dietary NFC. True protein, fat, and lactose yields were highest for ewes fed the M-SH diet (P < 0.05), reflecting their overall higher milk yields. Ewes fed the M-SH diet generated the highest concentrations of de novo, mixed, and preformed fatty acids per 100 g milk (P < 0.05). Lactose predicted milk yield (r² = 0.99) and the relationship between protein and milk yield was stronger (r² = 0.93) than the relationship between fat and milk yield (r² = 0.75). Mixed origin fatty acids had the strongest relationship with total fat concentration (r² = 0.71). Percentages of fatty acids that were de novo and mixed origin had means of 38.5 ± 0.27, and 26.7 ± 0.19, respectively, and were not affected by diet. Preformed fatty acid concentrations were highest (P < 0.05) for the M-SH diet (35.5 ± 0.16). The diet with medium soy hull inclusion supported significantly higher milk and milk component yields, as well as numerically higher milk fat concentrations.

Key Words: sheep, sheep milk, NDF

115 A high rumen degradable starch diet modulates jejunal microbiota and alters enterohepatic circulation of bile acids in dairy goats. J. Shen1, X. Chen2, L. Wang1, J. Yao1, and Y. Cao*1, 1Northwest A&F University, Yangling, Shaanxi, China, 2Harvard Medical School, Boston, MA.

The aim of this study was to investigate the mechanism of milk fat depression in the liver and small intestine of dairy goats fed different rumen degradable starch (RDS) diets. Eighteen Guanzhong lactating goats (2nd lactation, 45.8 ± 1.54 kg) in experiment 1 and 6 ruminally cannulated dairy goats (aged 2–3 y, 54 ± 2.4 kg) in experiment 2 were used to investigate the effect of dietary RDS content (LRDS = 20.52%, MRDS = 22.15%, HRDS = 24.88%) on liver metabolism and free-LPS concentrations, respectively. The treatments lasted for 28 d with 21 d for adaption and 7 d for sampling. In experiment 1, blood samples were collected for analyses of biochemical parameters; liver, ileal mucosa, and jejunal contents samples were collected for analysis of metabolites, mRNA expression and microbiota, respectively. In experiment 2, rumen fluid and blood samples were collected for determination of free-LPS. Comparisons were made between the treat-
ments using Student’s t-test. Free-LPS concentrations were analyzed using the MIXED procedure of SAS. Compared with LRDS, the HRDS significantly decreased the milk fat mass proportion (3.74% to 3.01%), enhanced the activity of alkaline phosphatase and aspartate aminotransferase in plasma, increased free-LPS concentrations in both rumen liquid (7500 EU/mL to 13600 EU/mL) and plasma (0.037 EU/mL to 0.179 EU/mL) (P < 0.05), indicating hepatic injury were induced by HRDS. HRDS significantly decreased the concentrations of certain fatty acids (included linolenic acid, etc.), and phospholipids (including PC (18:0/18:1), etc.), and increased the concentrations of L-carnitine and L-palmitoylcarnitine (VIP > 1, P < 0.10), and the protein expression of carnitine palmitoyltransferase-1 (P < 0.05) in liver compared with the LRDS, indicating HRDS promoted lipid β-oxidation. Compared with LRDS, HRDS significantly increased the relative abundance of *Firmicutes* and *Ruminococcus_2* in jejunal content (P < 0.05, LDA > 2), increased the concentrations of taurochenedeoxycholate and taurodeoxycholic acid (VIP > 1, P < 0.10) and mRNA expression of *CYP7A1* (P < 0.05) in liver, decreased the expression of bile acid receptor FXR (P < 0.05) in ileum mucosa, indicating the negative feedback regulation of bile acid synthesis was inhibited. This study demonstrated that HRDS feeding modulates jejunal microbiota and alters enterohepatic circulation of bile acids, and promotes lipid β-oxidation in dairy goats.

**Key Words:** bile acids, enterohepatic circulation, lipid metabolism

### 116 The effects of *Saccharomyces cerevisiae*-based products on the ruminal environment and performance of sheep submitted to dietary changes


The increase in the use of energy foods in ruminant can trigger important metabolic disturbances, making the use of additives an effective strategy in modulating the ruminal environment with performance optimization. The aim of the study was to evaluate the effects of *Saccharomyces cerevisiae* in maintaining ruminal pH, performance and metabolism in sheep submitted to changes in the diet starch concentration. For this purpose, 20 adult female sheep were used in a confined system and randomized assigned to 1 of 3 treatments: no yeast (Control; n = 6), yeast culture (YC; n = 7) and hydrolyzed yeast (HY; n = 7) supplemented with 5g/sheep/day. The groups were submitted to 4 experimental periods of 5 d, varying the composition of the diet in 40 and 60% wheat bran and the remainder composed of roughage based on corn silage. The diet in periods 1 and 3 was composed by 40% of wheat bran and periods 2 and 4 by 60% of wheat bran on DM basis. Feed offered was adjusted to achieve 3% of BW. Blood, ruminal fluid and BW were evaluated at the end of each period and the DMI was recorded daily. Ruminal fluid was analyzed to determine the physical parameters, ruminal pH, bacterial activity through the methylene blue test and evaluation of the motility of the protozoa under an optical microscope immediately after collection. Data were analyzed using NCSS software and the averages were analyzed using the mixed models method. Although rumen pH was not affected (P > 0.05) by treatment, protozoan motility was more efficient in supplemented animals (P < 0.05). The DMI was not affected, however, there was a trend to increase the daily gain (kg/d) in YM group in comparison with control in the third period (0.47 vs. 0.11 ± 0.26 kg) (P = 0.10). The HY showed an increase in total proteins (P < 0.01) in the last 2 periods in comparison with others, indicating a greater supply of available protein and a better adaptation to dietary changes, even with higher concentration of starch. The aspartate aminotransferase enzyme, an important indicator of liver damage, was greater (P < 0.01) in HY fed animals in the second period in comparison with control, which was maintained in the following period (97.7 vs. 80.1 ± 6.6 U/L). Yeast supplementation seems to be a potential tool when diet changes are necessary, partially by improving the performance of confined sheep.

**Key Words:** yeast culture, ruminal modulation, starch

### 117 Metabolic and productive characteristics of sensitive and heat-tolerant phenotypes of Murciano-Granadina dairy goats. S. Serhan1, S. González-Luna1,2, B. Chaalia1, X. Such1, A. A. K. Salama1, and G. Caja1, 1Group of Research in Ruminants (G2R), Universitat Autonoma de Barcelona, Bellaterra, Spain, 2F.E.S. Cuautitlan, Universidad nacional Autónoma de México, Cuautitlan, Mexico.

Thirty-three Murciano-Granadina does in mid-lactation (2.45 ± 0.14 kg/d milk; 40.9 ± 1 kg BW) were submitted to a short-term challenge (2 h) passing from thermo neutral (TN, THI = 65) to heat stress (HS, THI = 86) conditions. Variation of thermophysiological traits (RT, rectal temperature; RR, respiratory rate) were used to calculate the change ratio (CR = Σ after/before) and to select does differing in tolerance (TO, tolerant, 4.20 ± 0.21, n = 9; SE, sensitive, 6.25 ± 0.24, n = 10; P < 0.01). The does were allocated to a crossover of 2 periods (12-d each) with 2 climatic conditions: TN (15 to 20°C; THI = 65–67), and HS (30 to 37°C; THI = 88–79). RT, RR and lactational traits were recorded daily, whereas milk and blood samples were collected weekly. At the end of each period a glucose tolerance test (GTT; glucose, 0.15 g/kg BW; samples, min–120) was done. The HS does, increased RT 0.82°C (0.58 and 1.05°C a.m. and p.m. respectively; P < 0.001), RR 224% (164 and 285%, a.m. and p.m. respectively; P < 0.001) and water consumption (74%; P < 0.001), whereas decreased feed intake (–10%; P < 0.001), in comparison to TN. Milk yield increased by 5% (P < 0.005) but energy-corrected milk (2.0 ± 0.1 kg/d) did not vary by HS. Milk fat (–16%), protein (–14%) and lactose (–4%) contents decreased (P < 0.01) by HS. Blood glucose, insulin, and urea did not change; but HS goats had huge PRL and greater creatinine (819 and 14%, respectively; P < 0.01) than TN. Blood insulin did not vary between TN and HS does, but glucose disposal was greater in HS. Comparing TO and SE phenotypes, no differences were detected in RR, but p.m. RT was lower in the SE goats. No differences were detected in feed and water intakes, milk yield and composition, as well as in basal blood metabolites. AUC glucose at 60 min tended to be lower (P < 0.07) in SE than in TO goats. In conclusion, Murciano-Granadina goats, in terms of thermophysiological and lactational traits and blood metabolism, were moderately affected by HS. Responses to GTT indicated that HS increased insulin resistance and that TO and SE goats employed different mechanisms to keep blood glucose levels under HS conditions.

**Key Words:** heat tolerance, challenge, dairy goat