This study elucidated the effects of limited concentrate feeding on growth, plasma profile, and gene expression of gluconeogenic enzymes in the liver of dairy calves. The study utilized 12 Holstein male dairy calves (100 d of age) divided into 2 groups of 6 calves each for 155 d. Control group calves received 1.8 kg/calf/d (x = day) of concentrate, whereas calves in the restricted group only received 1 kg/calf/d. Good quality forage (Timothy hay) was available for ad libitum consumption to both groups. Body weights (BW) were recorded at start and at fortnightly intervals. Blood samples were collected at start and approximately 50 d interval. On d 100 and 155, liver biopsies were collected from all animals in each group. The BW was not different between the groups at the end of the study, however, at 6, 7, 8 and 9 fortnights higher (P < 0.05) BW were recorded in the control group than the restricted. Total BW gain in the control group was 114 kg as opposed to 98.2 kg in restricted group that led to average BW gain of 736 g/day and 634 g/day in respective groups, and the differences were significant (P = 0.051). As planned, the calves in the control group had higher concentrate and lower forage intake than the restricted group. The plasma variables (glucose, total protein, albumin, urea nitrogen, alanine aminotransferase (EC: 2.6.1.2) and amylase (EC: 3.2.1.1)) were within the normal range in both groups, but aspartate aminotransferase (EC: 2.6.1.1) was higher (P < 0.05) in control than restricted group and plasma triglycerides tended to be higher (P = 0.069) in restricted group than control. The mRNA expressions for the gluconeogenic enzymes, cytosolic phosphoenol pyruvate carboxykinase (EC 4.1.1.32) and pyruvate carboxylase (EC 6.4.1.1) measured by quantitative real-time PCR in liver biopsies showed no differences between groups. Overall, restricting concentrate moderately reduced the growth intensity without affecting the normal plasma indices and gene expression indicating that both concentrate feeding schemes can be successfully applied.

**Key Words:** calf, immune, plane of nutrition

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**T354 Influence of tannins-extract supplementation on plasma urea nitrogen concentration of bull-calves grazing Bermudagrass.**


Forty Bos indicus × Bos taurus bull-calves 176.43 ± SD 17.74 kg were used to determine the influence of tannins-extract supplementation on plasma urea nitrogen concentration of bull-calves grazing Bermudagrass. The experiment was performed from May 6 to June 3 of 2011 in the coast-plains of Sinaloa, localized in the Northwest of Mexico. Bull-calves were individually ear-tagged, weighed and randomly assigned to one of the next treatments: 1) Grazing in Bermuda paddock and receiving 1.5 kg/d of a protein supplement (Control); or 2) Similar to Control plus tannins-extract supplementation (TE). In groups of 20 bull-calves were placed in 2 3-ha paddocks of irrigated prairies of Bermudagrass (Cynodon dactylon L.), exclusively fertilized with feedlot cattle-manure. The protein supplement was formulate to contains 21% CP and 1.99 Mcal of NEEm by kg of DM, and its composition was as follows: 70.5% Corn dried distillers grains with solubles, 10% ground corn, 2.5% sugar cane molasses, and 17% of sea salt. Protein-supplement was delivery daily in amount equivalent to 1.5 kg/animal. Bull-calves in TE treatment receiving daily 33 g of TMP-Protein Enhancer (Técnica Mineral Pecuaria, México) a premix that contains 56% of condensed and soluble tannins-blend. Tannins extract was incorporated in the protein supplement. In d 1 and 28, blood samples were taken from jugular vein for plasma urea nitrogen (PUN) determination. At the beginning of the experiment in d 1, plasma urea nitrogen concentration was similar (P = 0.10) between treatments, with mean values of 16.40 and 17.95 mg/dL for Control and TE treatments, respectively. In d 28, TE-supplementation decreased (P < 0.01) 21.6% PUN concentration, with means values of 15.75 and 12.35 mg/dL for Control and TE treatments, respectively. The results suggest that tannins-extract supplementation is able to decreases plasma urea nitrogen concentration of bull-calves grazing tropical grasses as Bermudagrass.

**Key Words:** tannins, plasma urea nitrogen, bull-calves
The aim of this study was to determine the voluntary dry matter intake (VDMI) of silage from grasslands managed in 3 ways. Fourteen experiments were conducted in 2010 on 2 groups of heifers, 6 per group (Czech Fleckvieh, 300 ± 15 kg LW) and housed in 2 ways: loose-box housing (4 automatic roughage intake control troughs) and tie-stall housing (manual feeding). Each experiment was divided into a habituation period (14 d) and a testing period (10 d). Grasslands were managed as follows: A [Medium Intensive Utilization] - 3 cuts per year, N90P30K60 pure nutrients in kg per year and ha; B [Low Intensive Utilization] - 2 cuts per year, N90P30K60; and C [Extensive (control) Utilization] - 2 cuts per year, nil-fertilization. The grass silage was made by cutting grass and leaving it to dry naturally in the field. After wilting, (dry matter 38%) the mowed fodder was compressed into round bales. The data were analyzed using GLM with the software R version 2.9.1. The results of the VDMI for each group of heifers was calculated in grams (dry matter) per metabolic body unit (W0.75); next displayed as (g/MBU). Value of VDMI (P < 0.01) was higher in A (88.41 g/MBU, SE = 0.57) and B (72.14 g/MBU, SE = 0.60) than in C (68.34 g/MBU, SE = 0.63). Value of VDMI (P < 0.05) was higher too for the loose-box housing system (80.33 g/MBU, SE = 0.61) than the tie-stall housing system (74.42 g/MBU, SE = 0.65). On average from grasslands managed in 3 ways (from A to C), the NDF content rose from 486.8 to 571.1 g/kg dry matter (DM) and the net energy for lactation (NEL) decreased from 5.4 to 4.9 MJ/kg DM. There was a significant negative correlation between VDMI and the NDF (r = −0.82; P < 0.05), as well as a positive correlation between the VDMI and NEL (r = 0.79; P < 0.05). On the basis of the results, we can conclude that the value of the VDMI and nutrient intake was influenced by the grassland management (the higher the intensity of utilization, the higher the VDMI and nutrient intake) and housing system (greater VDMI was found for the loose-box housing).

Key Words: voluntary dry matter intake, grassland

T357 Assessment of bone metabolism in pregnant heifers with high and low residual feed intake. R. Dias1, J. Kim*1, S. Lopez2, Y. Montanholi1, B. Smith1, S. Miller2, and J. France3, 1University of Guelph, Guelph, Ontario, Canada, 2Universidad de León, León, Leon, Spain.

It is known that ruminants with lower residual feed intakes (RFI) use nutrients more efficiently than animals with higher RFI. However, the biological reasons and metabolic consequences underlying the variation in RFI between animals are not clear. There is also no information on whether RFI is related to differences in bone metabolism. Within this context 26 pregnant heifers (13 low RFI + 13 high RFI) in their first trimester of gestation were used for a bone metabolism study. Their blood was sampled once in the morning before feeding through jugular catheterization for analysis of osteocalcin and crosses in serum. These compounds are biochemical markers of bone formation and resorption respectively considered important clinical tools for assessment and monitoring of bone metabolism. Both markers were determined quantitatively using an immunoassay kit specifically for bovines. The results showed a lack of difference between animals with high and low RFI in the concentration of osteocalcin in serum with average concentration of 27 ± 10.9 ng/mL similar for both groups (P > 0.05), indicating that the efficiency of feed utilization by pregnant heifers does not affect their bone formation. Likewise the concentrations of bovine crosslaps were similar between the 2 groups of animals (P > 0.05), though the more efficient animals had a mean concentration of 16 ± 10.3 ng/mL and the group of animals with higher RFI gave a mean concentration of 8 ± 7.7 ng/mL. These findings suggest bone resorption is not affected by feed efficiency in pregnant heifers. Thus, this research provides an indication that bone metabolism is similar for pregnant heifers with lower and higher RFI. However more research is needed to provide further information.

Key Words: bone marker, feed efficiency, pregnant heifer

T358 Dried citrus pulp alters feedlot performance of crossbred heifers during the receiving period. J. T. Cribbs*1, T. R. Young1, M. A. Jennings1, N. C. Burdick2, J. A. Carroll2, T. R. Callaway3, T. B. Schmidt4, B. J. Johnson1, and R. J. Rathmann1, 1Texas Tech University, Lubbock, 2USDA-ARS, Livestock Issues Research Unit, Lubbock, TX, 3USDA-ARS, Food and Feed Safety Research Unit, College Station, TX, 4Mississippi State University, Department of Animal and Dairy Science, Starkville.

A study was designed to determine the effects of feeding dried citrus pulp pellets (DCP) on feedlot performance of newly received English × Continental heifers. Heifers (n = 180) were sourced in 2 loads (188.7 ± 18.0 kg and 225.2 ± 22.2 kg, respectively) from commercial auction barns and placed on trial at the Texas Tech University Beef Center in New Deal, Texas. A completely randomized block design was used by blocking by
BW nested within arrival load with 3 treatment diets being applied (36 pens; 5 heifers/pen; 12 blocks; 3 pens/block; 12 pens/treatment). Treatment diets were formulated to contain: 1) 0%; 2) 10%; or 3) 20% DCP on a DM basis. Diets containing DCP were formulated to be exchanged with steam flaked corn on a 1:1 basis. Cattle were fed a 63, 73, and 83% concentrate diet from d 0 to 28, d 28 to 42, and d 42 to 56, respectively. From d 0 to 28, there was a linear decrease in DMI (P < 0.001) which resulted in a linear decrease in ADG (P < 0.001) and G:F (P < 0.01) as the proportion of DCP in the diet was increased. From d 28 to d 42, DMI decreased linearly (P = 0.02) as the proportion of DCP in the diet increased; however, no difference in ADG was observed and G:F increased linearly (P < 0.01) in favor of treatments with a higher proportion of DCP. From d 42 to d 56, DMI did not differ across treatments, but ADG (P = 0.02) and G:F (P = 0.04) decreased linearly as the proportion of DCP in the diet increased. Over the entire 56 d trial period, as the proportion of DCP in the diet increased DMI decreased (P = 0.02; 6.70, 6.13, and 5.96 kg, for 0, 10, and 20% DCP, respectively), ADG decreased (P < 0.001; 1.88, 1.27, and 1.00, respectively), and G:F decreased (P = 0.02; 0.225, 0.210, 0.91, respectively). Collectively, it appears that regardless of the level of roughage in the diet, the inclusion of DCP pellets at levels of 10% or greater lowers DMI such that feedlot performance suffers. Future studies will need to evaluate inclusion levels of DCP less than 10% or evaluate alternative processing strategies of DCP to offset the negative effects of DCP on intake in diets of newly received calves.

Key Words: newly received cattle, feedlot performance, citrus pulp

T359 Effect of time of access to temperate pasture on nitrogen utilization, digestibility of nitrogen and microbial protein synthesis in heifers. N. Hernández1, A. Félix1, A. Pérez Ruche1, M. Aguerre1, C. Cujarville1, and J. L. Repetto*1, 1Departamento de Bovinos, Facultad de Veterinaria, UdelaR, Montevideo, Uruguay, 2Departamento de Nutrición, Facultad de Veterinaria, UdelaR, Montevideo, Uruguay.

The aim of this study was to evaluate if the time of access to forage (Lolium multiflorum, Trifolium repens; 19% CP, 48% NDF, DM basis) affects the nitrogen (N) utilization, apparent digestibility of N (DₐN) and the microbial protein synthesis (MPS) in heifers consuming temperate pastures. Twenty-four cannulated heifers (153.1 ± 18.1 kg BW) in a randomized complete block design were housed in individual cages and assigned to one of 4 treatments: T4, T6, T8 and T24 according to the time of access to fresh forage: 4, 6 8 or 24h/d, respectively. Pasture was daily cut and offered ad libitum as sole feed for all the treatments. The proportion of DCP in the diet increased linearly (P < 0.01). The efficiency of synthesis expressed as gMN/kgDOMI. We conclude that restricting time of access to forage reduced N intake that could have affect microbial protein synthesis.

Key Words: heifers, microbial protein, nitrogen utilization

T360 Comparison of pH, volatile fatty acids, and microbial quantification on rumen samples from young calves obtained via cannula or stomach tube. M. Terré*1, Ll. Castells1, and A. Bach2,1, 1Institut de Recerca i Tecnologia Agroalimentàries, Càrtes de Montbui, Spain, 2Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain.

The objective of this study was to compare rumen samples from young dairy calves obtained via a stomach tube (ST) or a ruminal cannula (RC). Five Holstein male calves (46 ± 4.0 kg of BW and 11 ± 4.9 d of age) were ruminally cannulated at 15 d of age. Calves received 4 L/d of a commercial milk replacer (25% CP and 19.2% fat) at 12.5% DM, and starter and chopped oat hay ad libitum throughout the study (56 d). A total of 29-paired rumen samples, obtained at different ages by each extraction method, were used to determine pH, VFA concentration, and quantify Fibrobacter succinogenes by qPCR. A paired t-test was used to determine whether the evaluated parameters differed between the rumen samples obtained from the different methods. There was a difference (P < 0.05) of 0.30 pH units between ST and RC samples, being greater in ST than in RC samples. Furthermore, the total VFA concentration was greater (P < 0.01) in RC than in ST samples. However, when analyzing the proportion of each VFA, the method of sampling only affected (P < 0.05) the relative proportion of butyric, isovaleric, and valeric acid. Probably, saliva contamination diluted ST samples lowering the VFA concentrations and causing small changes in VFA profile. On the other hand, the quantification of Fibrobacter succinogenes by qPCR was not affected (P = 0.43) by the extraction method. In conclusion, when comparing rumen parameters from different studies, it is preferred to use VFA profiles rather than total VFA concentrations, as the latter is more affected by the method of collection. Furthermore, while pH comparisons across studies should be avoided when samples are not obtained by the same sampling method, the comparison of specific rumen bacteria can be acceptable.

Key Words: rumen cannula, rumen samples, stomach tube

T361 Effects of limiting concentrate during growing period on performance and plasma variables, and gene expression of hepatic gluconeogenic enzymes and visfatin in Korean native beef calves. J. D. Lohakare*1, S. S. Chang 2, N. K. Singh 1, E. G. Kwon 2, J. Ghasemi Nejad1, K. I. Sung1, and S. K. Hong2, 1College of Animal Life Sciences, Kangwon National University, Chuncheon, South Korea, 2Hanwoo Experimental Station, National Institute of Animal Science, RDA, Pyeongchang, South Korea.

This study elucidated the effects of limited concentrate feeding on growth, plasma profile, and gene expression of gluconeogenic enzymes and visfatin in the liver of Hanwoo beef calves. The study utilized 20 Korean native beef calves (Hanwoo; 60–70 d of age) divided into 2 groups of 10 calves each for 158 d. Control group calves received the amount of concentrate as per the established Korean feeding standards for Hanwoo, whereas calves in the restricted group only received half the amount of concentrate as per standard requirements. Good quality forage (Timothy hay) was available for ad libitum consumption to both groups. Since calves were with their dam until 4 mo of age in breeding pens before weaning, the intake of milk before weaning was not recorded, however, the concentrate and forage intakes were recorded.
Body weights (BW) were recorded at start and on 10–15 d interval. Blood samples were collected at start and at 50 d interval. On the final day of the experiment, liver biopsies were collected from all animals in each group. The BW was not different between the groups at all times, but tended to be higher \((P = 0.061)\) only at final BW in control than restricted group. Total BW gain in the control group was 116.2 kg as opposed to 84.1 kg in restricted group that led to average BW gain of 736 g/day in respective groups, and the differences were significant \((P < 0.01)\). As planned, the calves in the control group had higher concentrate and lower forage intake than the restricted group. The plasma variables (glucose, total protein, albumin, urea, triglycerides, aspartate aminotransferase (EC: 2.6.1.1), alanine aminotransferase EC: 2.6.1.2) and amylase (EC: 3.2.1.1)) were within the normal range in both groups, but plasma total protein, and urea were higher \((P < 0.05)\) in control than restricted group and aspartate aminotransferase, alanine aminotransferase levels were lower \((P < 0.05)\) in control than restricted group showing the effects of diet. The mRNA expressions for the gluconeogenic enzymes such as cytosolic phosphoenol pyruvate carboxykinase (EC 4.1.1.32) and pyruvate carboxylase (EC 6.4.1.1), and visfatin measured by quantitative real-time PCR in liver biopsies showed higher expression \((P < 0.05)\) in restricted group than control. Overall, restricting concentrate severely reduced the growth intensity and gene expression in liver and few plasma indices indicating that restricting concentrate in the feeding schemes during early growth for beef calves is not advocated.

Key Words: Hanwoo calves, concentrate, gluconeogenic enzymes

T362 How the provision of forage in pre-weaned calves affects performance and digestibility after weaning. L. Castells*, A. Bach1,2, C. Montoro1, E. M. Rodríguez1, P. Ureña1, and M. Terré1, 1Department of Ruminant Production, IRTA, Caldes de Montbui, Spain, 2ICREA, Barcelona, Spain.

The objective of this study was to evaluate performance and diet digestibility after weaning in young Holstein calves fed non-forage and forage-supplemented diets during the pre-weaning phase. Sixty female Holstein calves (BW = 39.5 ± 3.76 kg) were randomly assigned to one of the 2 dietary treatments according to age and BW. Calves were individually housed and bedded with wood shavings. Dietary treatments consisted on feeding a pelleted starter (19% CP, 19% NDF) without any forage supplementation during the pre-weaning phase, and oats hay (68% NDF) supplementation post-weaning (CTR) or the same starter and forage fed during the pre and post-weaning phase (OAT). All calves were offered 3 L of milk replacer (MR) at 12% DM fed twice daily until 28 d of age, from 29 to 44 d of age calves received 1.5 L of MR at 12% DM fed twice daily, and from 45 to 51 d of age calves received 1.5 L of MR at 12% DM. Animals were weaned at 52 d of age. Intakes of starter and forage were recorded daily and BW weekly. Two weeks after weaning, total tract apparent digestibility was determined in 6 calves per treatment. Data were analyzed with a mixed-effects model with repeated measures, except for digestibility values that had no repeated measures. Starter intake was greater \((P < 0.05)\) in OAT compared with CTR animals (600 vs 503 ± 40.1 g/d, respectively) during the pre-weaning period. As a result, calves in OAT treatment grew faster \((P < 0.01)\) than CTR animals (520 vs 419 ± 22.9 g/d, respectively) during the pre-weaning period. After weaning, OAT animals consumed more \((P < 0.01)\) forage than CTR animals (146 vs 90 ± 11.7 g/d, respectively), but there were no differences between treatments in ADG and starter intake. Similarly, there were no differences in total tract apparent digestibility between treatments (78.3% DM digestibility, 43.0% NDF digestibility). Offering forage to young calves is necessary, and when offered early in life it allows improvements in growth before weaning.

Key Words: calves, forage, performance