

were corrected and the installation program was recompiled to support 64-bit Windows installations. We also created an installation program to allow the 2000 Beef NRC to be operated on modern Windows based computers. Both are available on the website. We are working to develop a review of techniques used to evaluate models, an article listing guidelines for reporting dietary information in publications, and an article describing a software platform that could be used across NRC species requirement models. We are also developing a database to store observational data collected by the NRC committees which can be downloaded and used for model development. Future work includes development of a web based mechanism to provide access to the model source code for use by the animal nutrition research community, collection of feedback from model users to help identify software problems and prediction problems, summarization of evaluations of the current NRC models, and an assessment of supply and requirement model subcomponents that could be used across species. These changes will facilitate the use of NRC models in diet formulation, update NRC models more rapidly as new information becomes available and at lower cost, and improve efficiency of feed use and sustainability in animal agriculture.

Key Words: NRC, nutrient requirements, nutrition model

T56 Effects of stage of gestation and diet on maternal fat deposition. P. P. Rotta¹, S. C. Valadares Filho¹, T. R. Santos¹, L. F. Costa e Silva¹, M. I. Marcondes¹, B. C. Carvalho², A. A. G. Lobo¹, J. V. F. Souza¹, M. A. S. Novaes¹, M. F. L. Ferreira¹, and J. S. A. A. Santos¹, ¹Universidade Federal de Vicosa, Vicosa, Brazil, ²Empresa Brasileira de Pesquisa Agropecuária, Brazil.

The objectives were to evaluate the maternal nutrient intake and stage of gestation on mesentery, kidney, pelvic and heart (KPH) fat and fat thickness growth rate in Holstein × Gyr cows. Sixty-two multiparous cows were inseminated with the same Gyr semen and in the d 30 the gestation was confirmed in 44 cows. Six cows non-pregnant were previously slaughtered as reference group. The 44 pregnant cows were randomly distributed in four time of gestation: 140, 200, 240 and 270 days. Thus, 11 cows were slaughtered in each time. These eleven cows were randomly allocated in two different diets: maintenance level (n = 6; 1.1% of body weight) and ad libitum (n = 5). The cows that achieved the time of gestation were slaughtered and necropsied. The mesentery was removed of the viscera and weighted. The KPH fat was removed and weighted. The fat thickness was measured using an electronic caliper rule 18 h after the slaughter. The values are given in function of final body weight. Data were analyzed using MIXED procedure of SAS. Data of non-pregnant cows were used considering as initial time. The growth rate of mesentery for cows fed ad libitum was exponential and the estimated equation was: $y = 2.7808 + 3.9181 \times [1 - \exp(-0.00726 \times \text{days})]$. However, the growth rate of mesentery for cows fed at maintenance level was linear and the estimated equation was: $y = 2.8351 + (0.00484 \times \text{days})$. In the same way, the KPH fat was exponential to cows fed ad libitum: $y = 1.0812 + 6.5984 \times [1 - \exp(-0.00172 \times \text{days})]$ while the estimated equation to cows fed at maintenance level was linear: $y = 1.1236 + (0.002572 \times \text{days})$. The fat thickness was also exponential to cows fed ad libitum: $y = 0.8033 + 0.0111 \times [\exp(0.0186 \times \text{days})]$ in comparison to cows fed at maintenance level, which estimated equation was linear: $y = 0.757 + (0.002986 \times \text{days})$. Thus, cows fed ad libitum present exponential growth rate of fat deposition, while cows fed at maintenance level present linear growth rate. This can be explained by the high dry matter intake observed to this group and the higher average daily gain. In this way, the excess of energy and protein are being deposited as fat.

Key Words: fat thickness, KPH fat, mesentery

T57 Effects of different diets on the gene expression of enzymes related to fatty acid synthesis in the mammary gland of lactating dairy cows. H. Zhang, C. Ao*, L. Song, E. Khas, and X. Zhang, Department of Animal Science of Inner Mongolia Agricultural University, Huhhot, Inner Mongolia, China.

The objectives of this study were to determine the effects of three different diets on the genes expression of key enzymes involved in fatty acid synthesis in the mammary gland of dairy cows. Thirty multiparous Holstein cows (BW = 566 ± 19.6 kg, DIM = 95 ± 24d) were assigned to a single factor block design with 30 d period. Animals were fed diets with different roughage and same concentrate profiles, the concentrate-roughage ratio in the treatments were different. Diets (on DM base) were: (1) hay (4%), corn silage (27%) and alfalfa (23%) with additional 46% of concentrate (MF; CP: 17.45%, NDF: 38.33% and NEL: 1.6 Mcal/kg); (2) corn straw (35%) and 65% of concentrate (CSA; CP: 17.14%, NDF: 41.58% and NEL: 1.58Mcal/kg); (3) corn straw (54%) and 46% of concentrate (CSB; CP: 13.80%, NDF: 55.59% and NEL: 1.36 Mcal/kg). Mammary gland tissue (500 mg/animal) biopsies were randomly performed for half numbers of cows in each group after milking on the last day of experiment. Gene expressions for key enzymes involved in fatty acids synthesis were determined by RT-PCR. Statistical analysis was performed using the PROC MIXED procedure of SAS 9.0. Results showed that mRNA abundance for ACACA and FASN which involve in de novo fatty acid synthesis was higher ($P < 0.05$) in MF compared to CSA and CSB. Gene expression for fatty acid desaturase SCD was significantly increased ($P < 0.01$) by MF treatment and gene expression for fatty acid uptake and intracellular trafficking enzymes LPL, ACSL1 and CD36 were increased ($P < 0.05$) also by MF. However, no effects were observed for milk fat synthesis regulator genes PPARA, PPARG, SREBF1 ($P > 0.05$). No effects on the gene expressions for all above enzymes and regulators between CSA and CSB were found. The data indicated that diet with high quality roughage and the same concentrate-roughage can increase the gene expression of enzymes related to fatty acid synthesis and desaturation, but with the same roughage and different concentrate-roughage ratio had no effect on milk fat synthesis key genes in the mammary gland of dairy cows.

Key Words: dairy cow, mammary gland, fatty acid synthesis

T58 Effects of stage of gestation and diet on dairy cow placentomes. P. P. Rotta¹, S. C. Valadares Filho¹, T. R. Santos¹, L. F. Costa e Silva¹, M. I. Marcondes¹, M. M. Campos², F. A. S. Silva¹, J. R. Oliveira¹, A. C. B. Menezes¹, E. C. Martins¹, and F. A. C. Villadiego¹, ¹Universidade Federal de Vicosa, Vicosa, Brazil, ²Empresa Brasileira de Pesquisa Agropecuária, Brazil.

The objectives were to evaluate the maternal nutrient intake and stage of gestation on caruncular, cotyledon and placentoma growth and number rate in Holstein × Gyr cows. Sixty-two multiparous cows were inseminated with the same Gyr semen and in the d 30 the gestation was confirmed in 44 cows. Six cows non-pregnant were previously slaughtered as reference group. The 44 pregnant cows were randomly distributed in four time of gestation: 140, 200, 240 and 270 days. Thus, 11 cows were slaughtered in each time. These eleven cows were randomly allocated in two different diets: maintenance level (n = 6; 1.1% of body weight) and ad libitum (n = 5). The cows that achieved the time of gestation were slaughtered and necropsied. The gravid uterus was removed and the uterus was separated from placenta. In the uterus, all carunculars were removed, counted and weighted. In the placenta, all cotyledons were removed, counted and weighted. Except for placentomas number, that consider 140 days of pregnancy at minimum, the

other equations consider the time 0 to time of pregnancy. Data were analyzed using MIXED procedure of SAS. Data of non-pregnant cows were used considering as initial time. For all parameters evaluated, the growth rate observed was exponential, except to placentomas number, which was linear. The weight of caruncular was similar ($P > 0.05$) between diets and the estimated equation was: $y = -0.5018 + 0.3992 \times \exp(0.008658 \times \text{days})$. However, the higher ($P = 0.0007$) value to cotyledons weight was observed to cows fed at maintenance level: $y = -0.0698 + 0.07697 \times \exp(0.01249 \times \text{days})$ in comparison to cows fed ad libitum: $y = -0.0698 + 0.07697 \times \exp(0.01115 \times \text{days})$. Placentomas weight were higher ($P = 0.0144$) to cows fed at maintenance level: $y = -0.568 + 0.4597 \times \exp(0.009739 \times \text{days})$ in comparison to cows fed ad libitum: $y = -0.568 + 0.4597 \times \exp(0.009303 \times \text{days})$. The number of placentomas was linear and higher ($P < 0.0001$) to cows fed at maintenance level. The estimated equation to maintenance was: $y = -53.8325 + (1.219 \times \text{days})$ and to cows fed ad libitum: $y = -53.8325 + (0.9717 \times \text{days})$.

Key Words: caruncular, cotyledon

T59 Rumen epithelial adaptation during the transition period is associated with structural changes and transcriptomic signatures. M. A. Steele*¹, O. AlZahal¹, C. Zettler¹, J. C. Matthews², and B. W. McBride¹, ¹University of Guelph, Guelph, Ontario, Canada, ²University of Kentucky, Lexington.

The structural and functional adaptations of the rumen epithelium during the transition period are largely undescribed. To characterize the adaptations of the rumen epithelium during transition, multiparous dairy cattle ($n = 12$) fed a low energy dry cow diet (1.45 Mcal/kg NE_L) were transitioned abruptly to a high-energy lactating cow diet (1.60 Mcal/kg NE_L) immediately after parturition. Dry matter intake and ruminal pH were monitored at -3 wk, +1 wk, and +6 wk relative to calving. To uncover changes in the ruminal epithelial structure and function, rumen papillae were biopsied at -3 wk, +1 wk, and +6 wk relative to calving. Histomorphometrics of rumen epithelial structure was examined under a light microscope and mRNA profiling was performed using Affymetrix GeneChip. Data pre-processing was conducted using Robust Multichip Average method and detection of significant genes was conducted using ANOVA. Dry matter intake was 13.1 ± 0.84 kg/d at -3 wk and 12.8 ± 0.84 kg/d at +1 wk, and increased ($P < 0.05$) to 21.0 ± 0.84 kg/d at +6 wk. Ruminal pH was reduced ($P < 0.05$) during the onset of lactation from 6.38 ± 0.07 at -3 wk to 5.81 ± 0.07 and 5.85 ± 0.07 at +1 and +6 wk, respectively. Microscopic examination of rumen papillae revealed an increase in epithelial sloughing during early lactation as sloughing scores increased ($P < 0.05$) from 1.7 ± 0.2 at -3 wk to 4.1 ± 0.3 and 3.4 ± 0.2 at +1 and +6 wk, respectively. A total of 1,144 and 535 differentially expressed genes (False discovery rate of 0.01, $P < 0.01$) were uncovered from -3 wk to +1 wk and +6 wk relative to parturition, respectively. Analysis of microarray results using Ingenuity Pathway Analysis revealed that metabolic and transport genes were regulated during early lactation, including mitochondrial dysfunction being the top pathway identified ($P < 0.01$) between -3 wk and +1 wk and +6 wk. These results suggest that the structure and function of the rumen epithelium is altered during early lactation and is associated with the differential expression of genes involved with metabolic functions.

Key Words: transition cow, rumen, epithelium

T60 Effects of stage of gestation and diet on maternal and fetal growth in dairy cows. P. P. Rotta*¹, S. C. Valadares Filho¹, T. R. Santos¹,

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The objectives were to evaluate the maternal nutrient intake and stage of gestation on gravid uterus, uterus, fetus and placenta growth rate in Holstein \times Gyr cows. Sixty-two multiparous cows were inseminated with the same Gyr semen and in the d 30 the gestation was confirmed in 44 cows. Six cows non-pregnant were previously slaughtered as reference group. The 44 pregnant cows were randomly distributed in four time of gestation: 140, 200, 240 and 270 days. Thus, 11 cows were slaughtered in each time. These eleven cows were randomly allocated in two different diets: maintenance level ($n = 6$; 1.1% of body weight) and ad libitum ($n = 5$). The diet was based on corn silage and concentrate at 93:7. The cows that achieved the time of gestation were slaughtered and necropsied. The gravid uterus was removed and weighted. After the opening of gravid uterus, uterus, placenta and fetus were removed and weighted separately. Data were analyzed using MIXED procedure of SAS. Data of non-pregnant cows were used considering as initial time. For all parameters evaluated, the growth rates observed were exponential. The gravid uterus presented a similar ($P > 0.05$) growth rate to cows fed ad libitum or at maintenance. The estimate equation was: $y = -1.104 + 1.7406 \times \exp(0.0132 \times \text{days})$. In the same way, the growth rate of uterus was similar ($P > 0.05$) between diets. The estimated equation was: $y = -0.591 + 0.9817 \times \exp(0.008836 \times \text{days})$. The growth rate of fetus was similar ($P > 0.05$) between diets and the equation was: $y = -1.2426 + 0.4939 \times \exp(0.01589 \times \text{days})$. However, the growth rate of placenta was higher ($P = 0.0125$) to cows fed at maintenance level: $y = -0.1324 + 0.1665 \times \exp(0.0118 \times \text{days})$ in comparison to ad libitum: $y = -0.1324 + 0.1665 \times \exp(0.01144 \times \text{days})$. Placenta is the organ most related to gestation and its growth rate is positively affected by maintenance level. This suggests that the organism tried to develop mechanisms to be more efficient in nutrient transfer to cows fed at maintenance level. In conclusion, the effect of stage of gestation is exponential and cows fed at maintenance level present higher growth rate to placenta.

Key Words: fetus, gravid uterus, placenta

T61 Determination of particle size distribution and physically effective fiber in total mixed ration from 14 dairy farms in the Comarca Lagunera, Mexico. P. A. Robles Trillo*¹, E. Vazquez-Martinez¹, F. G. Veliz-Deras¹, C. A. Meza-Herrera², and P. Cano-Ríos¹, ¹Universidad Autonoma Agraria Antonio Narro, Torreón, Coahuila, Mexico, ²Unidad Universitaria de Zonas Áridas, Universidad Autonoma de Chapingo, Bermejillo, Durango, Mexico.

In order to determine the particle size distribution (PSD) and physical effectiveness factor (PEF) in totally mixed ration (TMR) in dairy cattle farms, a cross-sectional study was conducted in 14 stables from the Comarca Lagunera, Mexico (25°N, 103°W). Farms were randomly selected and visited in summer in order to collect two freshly served samples of TMR; both the PSD and PEF were determined by the Penn State Particle Separator technique. The amount of PSD and PEF differed among farms ($P < 0.05$). In nine farms and using a 19 mm-sieve (S) PSD ranged from 4.85 to 8.86%, the remainder ranged from 12 to 23%. Above a 8-8 mm the PSD ranged among 32 to 54%, although seven stables had lesser than 40%. Regarding PSD using S 1.18 mm, the variation between farms was 16% (30 to 46%). When analyzing the plastic bottom pan, four farms had less than 10% of food collected while the rest ranged from 12-19%. The PEF 8 mm showed great variation, ranging from 38 to 61%, although eight stables were above 50%. Finally, with the PEF 1.18 mm, the range was 81 to 93% for all the stables. In