812 Meta analysis of responses of goats to chewing index. D. Sauvant*[1,2] and S. Giger-Reverdin[2], [1]*Agroparistech*, *Paris, France*, [2]*INRA - UMR PNA*, *Paris, France*.

The objective was to assess the interest of using a chewing index as predictor of dry matter intake (DMI), milk yield (RMY) and composition in dairy goats by using a meta-analysis A data base was constructed from 13 (nexp) experiments including 49 (n) treatment groups. The experimental factors were concentrate level (%CO = 27.6 ± SE 30.6 % DM; n = 49), dietary NDF %DM (NDF = 56.3 ± 14.5; n = 41). The following parameters were collected: DM intake % of live weight (DMI = 3.10 ± 1.00 % LW; n = 49), time spent eating (ET = 4.90 ± 1.74 h/d; n = 27), ruminating (RT = 6.77 ± 1.68 h/d; n = 47) or chewing (CT = 11.51 ± 2.79 h/d, n = 29) and the chewing index (CI = 7.89 ± 7.72 hCT/kg DMI, n = 29). When simultaneously measured, CT and RT were closely related (CT = 2.12 + 1.47 RT; n = 27, nexp = 10, R2 = 0.98, rmse = 0.55). Therefore, 20 values for CI were estimated from RT ones (CI = 11.29 ± 7.57 h/kg DMI, n = 47). The other items were RMY (2.72 ± 1.33 kg/d; n = 25), milk fat (MFC = 3.85 ± 1.07 %; n = 25) and milk protein contents (MPC = 3.20 ± 0.29 %; n = 25). The statistical methods used were either the global regression or the GLM procedure in order to check inter and intra experiment variations.

DMI was negatively correlated with CI, the global relationship being quadratic (DMI = 4.99 - 0.24 CI + 0.004 CI2, n = 49, R2 = 0.80, rmse = 0.30). Also, there was a global negative relationship between RMY and CI (RMY = 5.21 × 0.48 CI, n = 25, R2 = 0.50, rmse = 0.96). For these two cases, CI estimations did not alter the regression. Due to variations across experiments, there was no global relationship between MFC and CI. In contrast, the within experiment relationship was significant and fairly accurate (MFC = 2.79 + 0.19 CI, n = 25, nexp = 10, R2 = 0.98, rmse = 0.19). For MPC, there was no global or intra relationship with CI. MFC becomes lower than MPC when CI became lower than 1.8 h/kg DMI.

In conclusion, CI can be valuable to globally explain DMI (fill effect) and RMY variations in goats and to predict MFC in given conditions.

Key Words: Dairy Goat, Chewing Index, Milk Fat Content

813 Is chewing efficiency of dairy cows effected by physiological stage? I. Schadt*[1], J. D. Ferguson[2], G. Azzaro[1], R. Petriglieri[1], C. Guardiano[1], and G. Licitra[1,3], [1]*CoRFiLaC Regione Siciliana*, *Ragusa, Italy*, [2]*University of Pennsylvania*, *Kennett Square*, [3]*D.A.C.P.A. Catania University*, *Catania, Italy*.

Feed particle size and breakdown have been related to intake, milk production, passage and metabolic disorders. In the present study the particle distribution of swallowed boli during initial feed ingestion from forages fed at various lengths and TMR were measured in both dry and lactating cows. Six ruminally fistulated animals were examined. The study was conducted at two periods. In each period, two dry animals were compared to two animals at >200 DIM. Cows were held off feed for 12 hours, rumens evacuated, and offered 0.25 kg of forage or TMR. Rumen digesta and fecal samples were collected. Swallowed boli were manually retrieved from the reticulo-rumen at the esophageal orifice. Treatments in period 1 were ryegrass hay at various chop lengths: (1) long hay; (2) hay cut to 5 cm lengths; (3) chopped hay retained on a 1.91 cm screen; (4) chopped hay passing a 1.91 cm screen but retained on a 0.787 cm screen, and (5) chopped hay passing a 0.787 cm screen but retained on a 0.127 cm screen. In period 2, in addition to treatments 1-5, vetch hay (6), corn silage (7), grass silage (8) and TMR (9) were examined. Particles were analyzed by sieving with image analysis. Mean particle sizes (mm) for treatments were as follows (superscripts differ by $p<.05$): (1) long hay, not determined; (2) 43.4^{a}; (3) 41.4^{a}; (4) 24.9^{b}; (5) 5.2^{c}; (6) vetch hay, not determined; (7) 3.0^{cd}; (8) 4.6^{cd}; (9) 2.2^{cd}. Mean particle bolus sizes (mm) by treatments were as follows (superscripts differ by $p<.05$): (1) 3.5^{ab}; (2) 2.7^{bd}; (3) 3.5^{ab}; (4) 4.0^{ac}; (5) 2.3^{de}; (6) 3.6^{ad}; (7) 2.3^{de}; (8) 2.6^{de}; (9) 1.5^{e}. Feed and bolus mean particle size were not affected by stage of lactation. Mean rumen digesta particle size of dry cows (1.0 mm) was significantly shorter than in lactating cows (1.5 mm), $p<.05$. Mean fecal particle size (0.8mm) was not affected by stage of lactation.

Key Words: Feed Particles, Bolus Particles, Dairy Cattle

814 Competition at the feeder alters feeding and social behavior of transition dairy cows. K. L. Proudfoot*[1], D. M. Veira[2], D. M. Weary[1], and M. A. G. von Keyserlingk[1], [1]*University of British Columbia*, *Vancouver, BC, Canada*, [2]*Pacific Agri-Food Research Centre*, *Agassiz, BC, Canada*.

Transition cows require sufficient dry matter intake (DMI) to meet the increasing nutrient demands of lactation. Management strategies that reduce competition can increase feeding activity of mid-lactation cows, but it is unclear if this is true for the transition cow. Moreover, it is often recommended that primiparous cows (PP) be managed differently from multiparous cows (MP), yet little evidence supports this claim. The objectives of this study were to test the effect of an overstocked feeder on transition dairy cow feeding and social behavior, and to identify any differences in the behavior of MP and PP cows. DMI, feeding and social behavior were monitored from 2 wk before to 2 wk after calving for 110 Holstein dairy cows using an electronic feeding system. Cows were assigned to a competitive (C, 2:1 cows:bin) or non-competitive (N, 1:1 cow:bin) treatment. Cows diagnosed with clinical illness were removed from the dataset. Each cow on the N treatment was matched for parity and baseline feeding data with one cow from a pair in the C treatment, resulting in 20 matched pairs (PP=16 and MP=24). Differences in feeding behavior between treatment and parity groups were tested using a mixed model with day as a repeated measure, and a t-test was used to detect differences in social behavior. Although MPC cows visited the feeder more often (34 vs. 28 visits/d, P=0.03), they consumed less feed (14.3 vs.15.3 kg/d, P=0.01) and ate at a faster rate (123 vs. 106 g/min, P<0.01) than MPN cows. Treatment had no effect on the DMI of PP cows, but PPC tended to eat fewer meals (9 vs. 10 meal/d, P=0.07) and these meals were longer in duration (30.8 vs. 25.4 min/meal, P<0.01) and larger in size (1.6 vs. 1.4 kg/meal, P=0.07) than PPN cows. Regardless of parity, cows on the C treatment encountered more aggressive interactions than cows on the N treatment (24 vs. 8/d, P<0.001). The results of this study indicate that limited access to feeder space can alter feeding behavior and increase aggression in both MP and PP transition cows.

Key Words: Transition, Competition, DMI

815 Animal feed assessment quality by SMartNose®. T. Rapisarda*[1], G. Belvedere[1], F. La Terra[1], A. Cannas[2], G. Licitra[3,1], and S. Carpino[1], [1]*CoRFiLaC, Regione Siciliana*, *Ragusa, Italy*, [2]*University of Sassari*, *Sassari, Italy*, [3]*University of Catania*, *Catania, Italy*.

Animal feed quality for livestock has an important role in good farm management. In order to have an efficient and effective diet, it is important to have feeds of uniform quality. The objective of this study was to compare animal feed samples, from Sicily and Sardinia, by their content of volatile compounds. Ten feeds from these different Italian regions were analyzed by MS-based Electronic Nose (SMartNose®): Brazilian soybean meal, dehydrated alfalfa, wheat bran, beet pulp, pea seed, tick bean, corn gluten meal, sunflower meal, wheat flour middlings and barley grain. The feeds (three replicates per feed) were analyzed by a MS-based electronic nose (SMartNose®) to detect their organic volatile components in the mass-to-charge (m/z) range of 10 to 160 amu. Results were subjected to a principal components (PCA) analysis. Feed samples showed the best separation with PC1 (50.65%) and PC2 (19.38%). The effect of different volatile compounds was discriminant for five feed samples: Brazilian soybean meal, dehydrated alfalfa, wheat bran, beet pulp, and wheat flour middlings. Electronic Nose technology is simple and fast to use, especially if there are a lot of samples to analyze, and represents a very useful tool for discrimination of different feed qualities. Further studies are needed to create a data base and to study different qualities in animal feeds.

Key Words: Feed, SMartNose®, Volatile Compounds

816 Prediction of in vivo diet digestibility in lactating dairy cows from data based on values obtained using sheep. P. Huhtanen*[1], M. Rinne[2], and J. Nousiainen[3], [1]*Cornell University*, *Ithaca, NY*, [2]*MTT Agrifood Research*, *Jokioinen, Finland*, [3]*Valio Ltd*, *Helsinki, Finland*.

Traditionally the tabulated feed values are based on the digestibility coefficients measured with sheep fed at maintenance level, and the energy value of the diet is assumed to be the sum of individual components without associative effects between dietary ingredients. These coefficients are applied to cattle fed at higher intakes of diets consisting of several ingredients. The objectives of the present study were (1) to evaluate the combined effects of species (sheep vs. cattle) and feeding level on diet digestibility and (2) to develop equations predicting diet digestibility from sheep data. A meta-analysis of dairy cow data was conducted using 497 diets from 92 studies. Diet digestibility in cows was determined by total fecal collection (n=176) or using acid insoluble ash as an internal digestibility marker (n=321). Diet OM digestibility (OMD) at maintenance level of feeding (OMDm) was estimated using in vivo or in vitro digestibility for forages and tabulated values for concentrate ingredients. A mixed model regression analysis with random study effect was used to analyze the data.
Fecal output of metabolic matter (OM-NDF) averaged 96 (SE 0.7; n=388) g/kg DMI and was not influenced by diet composition or DMI (P>0.2). Forage OMD was positively associated with OMD of the total diet in cows, but the level of concentrate feeding had no effect on OMD in the cows. Protein supplementation improved quadratically OMD. Increased total DMI (TDMI) depressed OMD by 0.0026 units per kg. The following equation was fitted to estimate OMD in cows: OMD = 0.252 + 0.702 × OMDm - 0.0026 × TDMI + 0.0203 × CCPI - 0.0144 × CCPI^2, where CCPI is concentrate CP intake (kg CP above 170 g/kg DM). Residual error of the model was small (0.0089) indicating that diet digestibility in dairy cows can be estimated accurately and precisely from digestibility coefficients estimated in sheep. The equation takes into account both feeding level effects and associative effects in digestion.

Key Words: Digestibility, Cow vs. Sheep, Feeding Level

817 Depression in nutrient digestibility by lactating dairy cows when dry matter intake is expressed as a multiple of maintenance. D. P. Casper*[1] and D. R. Mertens[2], [1]*Agri-King, Inc.*, *Fulton, IL*, [2]*USDA-ARS Dairy Forage Research Center*, *Madison, WI*.

The latest edition of the National Research Council's (NRC) Nutrient Requirements of Dairy Cattle, 7th Revised Edition in 2001, calculates a reduction in digestibility due to increasing dry matter intake expressed as a multiple of maintenance (MM). Data from nonlactating cows was used to determine the depression in digestibility with increasing MM. Our objective was to evaluate the reduction in nutrient digestibility per MM by lactating dairy cows. The Energy Metabolism Database includes data from all energy and N balance trials that were conducted at the Energy Metabolism Unit of the USDA-ARS (3,018 individual energy and N digestion trials). Only 1,351 of the individual metabolism trials used lactating dairy cows of different breeds and stages of lactation that were fed diets that varied in forage types, grain sources, protein sources, and fat supplements. All data were analyzed using linear regression procedures of SAS. Initial data analysis indicated that ruminal acidosis may have occurred in some balance trails, which could affect the nutrient digestibilities. Thus, metabolism trials of lactating dairy cows having inverted fat and protein ratios (acidosis criteria) were removed, which resulted in 495 observations for evaluating nutrient digestibility related to MM, which ranged from a minimum of 1.36 to a maximum of 4.98. Dry matter digestibility (DMD) was reduced as MM increased (DMD, % = 68.7 – 0.54*MM: R^2=.012, P<.02), but the relationship was not strong. However, N digestibility (ND) was not affected by MM (NDP, % = 63.4 + 0.45*MM: R^2=.003, P<.18). While NDF digestibility (NDFD) was increased with increased MM (NDFD, % = 37.4 + 2.47*MM: R^2=.04, P<.01), but the relationship was weak. It would appear that the reduction in nutrient digestibility per MM by lactating dairy cows across all diets is not as high as the value used by the NRC in calculating the energy values of feeds. Additional analysis is needed to confirm if significant depression in digestibility occurs within diets for MM typical of lactating dairy cows.

Key Words: Digestibility, Intake, Maintenance