334 Moment and allocation of corn silage on dry matter intake and milk production of grazing dairy cows. D. A. Mattiauda*[1], M. Carriquiry[1], S. Tamminga[2], F. Elizondo[1], and P. Chilibroste[1], *[1]Departamento de Produccion y Pasturas, Facultad de Agronomia, UdelaR, Paysandu, Uruguay, [2]Department of Animal Science, Wageningen University, Wageningen, the Netherlands.*

Thirty-three multiparous Holstein cows were used in a randomized block design to study the effects of feeding strategies (corn silage allocation during the day) in early lactation (48 ± 17.8 d). All cows (separated by treatment) had access to an ungrazed daily strip of pasture (1535 ± 289 kg DM/ha; forage allowance: 15 kg DM/cow) from 0900 to 1500 h and received 2.7 kg DM of concentrate at each milking (0430 and 1530 h). Corn silage (3.9 kg DM/d) was offered 100% at 1700 h (T1), at 0800 h (T2) or equally distributed at 1700 and 0800 h (T3). Experimental period lasted 7 wk with 1 wk of adaptation and 6 wk of measurements. Milk yield was recorded daily and milk samples were collected weekly (2 consecutive days) for fat, protein, and lactose composition. Cow BCS was recorded every 2 wk. Individual herbage DMI was determined during 4 d at wk 7 in 12 cows (4 complete blocks), using n-alkanes. Data were analyzed with a mixed model including treatment, week of treatment and their interaction (if corresponded) as fixed effects and block as a random effect. Herbage DMI was greater ($P < 0.04$) for T1 and T3 than T2 cows (10.3, 8.5, and 11.0 ± 0.68 kg/d for T1, T2, and T3, respectively) which defined a difference between treatments in total DMI (19.5, 17.7, 20.0 ± 0.68 kg/d for T1, T2, and T3, respectively). There was no difference in milk yield among treatments (25.2 ± 0.62 kg/d) but fat percentage was greater ($P < 0.04$) for T3 than T2, being intermediate in T1 cows (3.85, 3.66 and 3.89 ± 0.072% for T1, T2, and T3, respectively), resulting in a trend ($P = 0.10$) for greater 4% fat-corrected milk yield (24.6, 23.7 and 25.3 ± 0.84 kg/d for T1, T2, and T3, respectively). Protein (2.97 ± 0.048%) and lactose (4.74 ± 0.045) percentages did not differ among treatments. Cow BCS was greater ($P < 0.03$) for T3 than T2, being intermediate in T1 cows (2.42, 2.37, 2.52 ± 0.063 for T1, T2, and T3, respectively). Corn silage allocation related to grazing session had an effect on DMI and productive performance, probably due to the integration of the animal grazing strategy and rumen fermentation.

Key Words: feeding strategy, corn silage, grazing

335 Predicting dry matter intake of Holstein calves. J. C. M. Lima[1], J. P. P. Rodrigues[1], M. I. Marcondes*[1], M. M. Campos[2], T. E. Silva[1], A. S. Treece[1], N. C. S. Gonzaga[1], and A. F. W. Oliveira[1], *[1]Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil, [2]Embrapa Gado de Leite, Juiz de Fora, Minas Gerais, Brazil.*

This study aimed to develop a model to predict dry matter intake (DMI) in dairy calves. Thirty-two male Holstein calves, with 3 d of age and average live weight of 35.56 ± 5.86 kg, were used. The animals were distributed into a completely randomized design and allocated in individual houses. The treatments consisted of different amounts of raw milk (12.43% DM; 3.19% fat; 2.68% CP on natural matter basis), which were: 2, 4, 6 and 8 L/day, fed twice a day, in 8 replications. All calves were fed starter (19.75% CP) ad libitum and feed intake was registered daily from 3 to 59 d old. Total dry matter intake (TDMI; kg/day) was obtained summing milk dry matter intake (MDMI) and starter dry matter intake (SDMI; kg/day). TDMI equations were regressed for each treatment by days according to the model: $TDMI = \beta_0 + e^{(\beta 1 \times d)}$. SDMI was regressed by milk intake (MI; liters/day) and day according to the model: $SDMI = \beta_0 \times MI + \beta 1 \times e^{((\beta 2 \times MI + \beta 3) \times d)}$. The TDMI equations obtained for each treatment was: $TDMI = 0.2405(\pm 0.0165) \times e^{0.0279(\pm 0.0010) \times d}$; $TDMI = 0.3156(\pm 0.0135) \times e^{0.0262(\pm 0.0007) \times d}$; $TDMI = 0.4957(\pm 0.0227) \times e^{0.0173(\pm 0.0007) \times d}$ and $TDMI = 0.7068(\pm 0.0215) \times e^{0.0125(\pm 0.0005) \times d}$ for 2, 4, 6 and 8 L/day, respectively. The β_0 values indicate that initial intake was greater with greater milk amounts, while β_1 suggests that the rate of increasing in dry matter intake was more expressive for calves fed lower milk amount. Afterward, β_0 and β_1 of each equation were linear regressed on milk intake to compose a single equation to predict TDMI in calves. The equations to predict TDMI and SDMI according to milk intake and age were, respectively: $TDMI = (0.079 \times MI + 0.0449) \times e^{((-0.0028 \times MI + 0.0348) \times d)}$ and $SDMI = -0.013 \times MI + 0.125 \times e^{((-0.003 \times MI + 0.034) \times d)}$. Negative value obtained for parameters linked to milk intake (β_0; β_2) suggests that initial starter intake was lower for greater milk intake. Considering that when using 2 prediction equations the sum of random errors might be greater, it is suggested to estimate SDMI by the equation: $SDMI = DMI - MDMI$. It can be concluded that TDMI and SDMI can be explained by calf age and milk intake. Supported by CNPq/Fapemig.

Key Words: calf, milk, starter

336 Abrupt changes in forage dry matter of one to three days affect intake and milk yield in lactating dairy cows. J. Boyd*[1] and D. R. Mertens[2], *[1]US Dairy Forage Center, Madison, WI, [2]Mertens Innovation & Research LLC, Belleville, WI.*

Our objective was to determine the effects of 1, 2, and 3d changes in forage DM on lactating cow performance across stage of lactation or parity. Data was compiled from 2 studies: Study A (fall 2009) early lactation cows averaging 65 DIM and 43.3 kg milk/d and Study B (fall 2012) late lactation cows averaging 192 DIM and 40.7 kg milk/d (total of 44 primiparous and 44 multiparous Holstein cows) housed in a tie stall barn. Within parity, cows were assigned to 1 of 11 blocks based on production and days in lactation. Study design was replicated 2 × 2 Latin Squares for each set of 1-, 2-, or 3-d treatments. Each period consisted of a 3-d pre-treatment, 1- to 3-d treatment, and a 3-d post-treatment phase. Diets were control (Ctrl) with no water added and treatment (Trt) with water added to decrease forage DM by 8%-units, to mimic rainfall events on a bunker silo and feeding an imprecise ration based on as-fed ratios of ingredients. Ctrl rations were adjusted daily to maintain DM ratios of ingredients. Feed offered was adjusted daily for both Ctrl and Trt based on the previous day's refusal. Milk yield was recorded daily and samples were taken 2× daily. Forages, TMR, and refusals were sampled daily and concentrates sampled 2× weekly. Chemical composition (DM, CP, aNDF) of samples were determined by NIR. Data was analyzed using Proc MIXED of SAS with cow within parity-block as a random variable. On d 1, DMI was reduced 2.3 ($P < 0.0001$), 1.5 ($P < 0.0001$), and 0.91 kg ($P < 0.0001$), for the 1-, 2-, and 3-d treatments, respectively, but DMI recovered during the following 1 to 3 d even during Trt phases. Although daily milk decreased slightly on d 1 of each Trt, the decrease was largest on d 2: −1.06 ($P = 0.003$), −1.48 ($P = 0.0003$) and −0.79 kg ($P = 0.03$), for the 1, 2, and 3d treatments, respectively. No parity effect was observed, but late lactation cows were not as susceptible to diet DM change as early lactation animals. We concluded that abrupt changes in forage DM causes economically significant reductions in daily milk yield, but the duration of the change does not worsen the losses if offered ration amounts are adjusted daily.

Key Words: DM changes, silage, feeding

337 Dry matter intake in crossbred dairy calves. A. L. Silva[1], M. I. Marcondes*[1], M. M. Campos[2], T. E. Silva[1], A. S. Trece[1], J. S. A. A. Santos[1], S. G. S. Moraes[1], and J. P. P. Rodrigues[1], *[1]Universidade*

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The liquid-feeding phase is extremely important in animal production systems. Therefore, it becomes necessary to establish measures to maximize animal performance during this phase. Dry matter intake (DMI) affect directly the animal performance, because it's the main determinant of entry of nutrients to meet animal requirements. The objective was to determine the DMI for crossbred Holstein-Zebu calves aged between 0 and 60 d. The experiment was conducted at Department of Animal Science, at Universidade Federal de Viçosa, Brazil. Eighteen male calves, crossbreed Holstein-Zebu, with initial BW of 36 ± 5.5 kg, were used. The animals were allotted to 3 treatments, with 6 replications. Treatments consisted of 3 different levels of milk intake, which were 2, 4 and 8 L/d. The animals had free access to water and concentrate (starter), which was formulated in accordance with the requirements presented in NRC (2001). The animals were fed twice a day, at 6:00 and 15:00, and starter intake was measured every day at 6:00h. Environmental variables were also considered: relative humidity (RH), temperature and humidity index (THI) and black globe temperature and humidity index (BGTHI). Environmental effects, milk intake and age were used in a multiple regression model, considering both linear and quadratic effects, to estimate calves DMI. The test was conducted using the MIXED procedure, at the level of significance of 5%. The DMI was affected by milk intake ($P < 0.001$), THI ($P = 0.0453$) and age of the animals ($P < 0.001$). However, no significant quadratic effects were observed ($P > 0.05$), thus the final regression can be expressed by equation. $DMI = 0.4272 + 0.6741 \times M - 0.0059 \times THI + 0.0122 \times D$; where: DMI = Dry matter intake (kg/day), M = Milk intake (kg/day of DM), THI = Temperature and humidity index (without dimensional), D = Age of animal (days). The SI can be estimated by the difference between the total DMI and the DMI from milk. It can be concluded that the DMI in calves can be estimated using parameters as milk intake, THI and age of animals.

Key Words: environmental effect, feed, milk

338 The study of ruminal degradation of canola meal in dairy cows. Y. J. Tian[1,2], Y. Zeng[1,2], Z. J. Cao[1,2], and S. L. Li*[1,2], *[1]College of Animal Science and Technology, China Agricultural University, Beijing, China, [2]State Key Laboratory of Animal Nutrition, Beijing, China.*

The objective of this paper was to determine the rumen degradability of Canola. Two types of diets were formulated at a 4:6 (DM basis) concentrate: forage ratio according to 1.3× maintenance or 2.5× maintenance nutrients levels, respectively. Ruminal degradation rates of dry matter (DM) and crude protein (CP) of 2 kinds of canola meals (CM1, CM2) and 2 other kinds of domestic regular rapeseed meals (DRM1, DRM2) were determined using in situ method in the cows fed the above 2 types of diets. The results suggested that ruminal degradation kinetics of DM and CP of the 4 kinds of rapeseed meals had the similar variation trend. The effective degradation of DM and CP were higher for all the rapeseed meals measured in the cows fed the diets with 1.3× maintenance compared with the 2.5× maintenance level. With the same nutrients levels, DM and CP digestion rates of CM was generally higher than that of DRM. The total digestion rates of CP of CM were no differences between 2 maintenance nutrients levels. However, the total digestion rate of CP of DRM on the 1.3× maintenance nutrients level was higher than that on the 2.5× maintenance nutrients level.

Table 1. Rumen effective degradation of DM (top) and CP (bottom) in cows fed diets at 1.3 and 2.5× maintenance level

Sample	1.3×	2.5×	SEM	P-value[1]
CM 1	48.45	45.30	1.09	0.158
CM 2	49.22	47.11	1.28	0.453
DRM 1	45.12	39.18	1.23	0.002
DRM 2	51.05	43.16	1.88	0.019
CM 1	59.86	52.61	1.77	0.024
CM 2	61.58	57.61	1.22	0.104
DRM 1	57.11	49.30	1.54	<0.001
DRM 2	66.93	55.76	2.25	0.001

[1]$P < 0.05$ = significant difference, $P < 0.01$ = very significant difference.

Key Words: canola meal, rumen degradation, dairy cow

339 Meta-analysis: Effect of corn silage hybrid type on intake, digestion, and milk production by dairy cows. L. F. Ferraretto* and R. D. Shaver, *University of Wisconsin–Madison, Madison.*

A meta-analysis was performed to evaluate the effects of corn silage hybrid type on digestion, rumen fermentation and lactation performance by dairy cows using a data set of 139 treatment means from 45 peer-reviewed articles published 1990–2013. Categories for hybrids differing in grain and stalk characteristics, respectively, were: conventional (CONG), nutridense (ND), high oil (OIL), and waxy (WAXY); conventional, dual-purpose, isogenic or low-normal fiber digestibility (CONS), brown midrib (BMR), high fiber digestibility (HFD), and leafy (LFY). Genetically-modified (GM) hybrids were compared with their genetically similar non-biotech counterpart (ISO). Data were analyzed using Proc Mixed in SAS with hybrid as fixed and trial as random effects. Silage nutrient composition was similar ($P > 0.10$), except for lower ($P < 0.01$) CP% and EE% for CONG than ND and OIL. Milk fat content and yield and protein% were lowest ($P < 0.05$) for OIL. Intake, milk production and total tract nutrient digestibilities were unaffected ($P > 0.10$) by grain hybrid type. Except for lower ($P < 0.001$) lignin% for BMR, lower ($P < 0.05$) starch% for HFD than CONS, and a trend ($P < 0.10$) for higher NDF% for HFD, silage nutrient composition was similar ($P > 0.05$) among hybrids of different stalk type. Intake, milk, and protein yield were 1.6, 1.3, and 0.05 kg/cow/d, respectively, greater ($P < 0.01$) for BMR than CONS and LFY on average. Likewise, DMI and milk yield were 0.6 and 0.9 kg/cow/d greater ($P < 0.01$) for HFD than CONS. Total tract NDF digestibility was greater ($P < 0.001$) and starch digestibility reduced ($P < 0.01$) for BMR and HFD than CONS or LFY. Rumen pH tended ($P < 0.10$) to be lower for BMR than CONS. No differences in lactation performance were observed for GM compared with ISO ($P > 0.10$). Except for negative effects of OIL on milk fat and protein percentages, differences were minimal among corn silage hybrids differing in grain type. Except for positive effects of BMR and HFD on intake and milk yield, differences were minimal among corn silage hybrids differing in stalk type. However, reduced total tract starch digestibility for BMR merits further study.

Key Words: corn silage, hybrid, dairy cow

340 Responses of late lactation cows to forage substitutes in diets supplemented with byproducts. M. B. Hall*[1] and L. E. Chase[2], *[1]US Dairy Forage Research Center, USDA-ARS, Madison, WI, [2]Department of Animal Science, Cornell University, Ithaca, NY.*