carbohydrates which are required for lactic acid fermentation. In addition, tropical legumes contain high concentrations of buffering substances which counteract the desired quick pH drop for optimal conservation. This experiment was designed as a completely randomized design with four replications of three silages made either from guinea grass, hairy indigo or a 50:50 mixture of both forages on a w/w basis. Silages were stored in 20-L plastic containers, without additives, for 56 days. Cell wall components and N concentrations were assayed. Volatile fatty acid analyssi was performed using gas chromatography. Results are shown in Table 1. Ensiling a 50:50 mixture of hairy indigo and guinea grass resulted in intermediate values for lactic acid, CP, NDF and lignin concentrations compared to the legume or grass alone. The pH and the concentrations of ADF of the mixture were similar to the grass but lower than for the legume. Acetic acid concentrations did not increase with addition of the grass to the legume. Butyric acid was not detected. These data indicate that guinea grass added to hairy indigo in equal proportions increased NDF and decreased CP concentrations, enhanced silage fermentation and quality, and decreased the pH to values needed for adequate forage preservation.

Table 1. Fermentation characteristics of hairy indigo and guinea grass, or ensiled in combination

Treatment	DM	pH	Lactate	Acetate	Butyrate	CP	NDF	ADF	Lignin
					% DM				
Legume	24.90a	6.03a	6.9c	1.1b	0.00	17.75a	45.77c	46.20a	12.63a
50:50	23.61a	4.79b	8.1b	1.6b	0.00	15.42b	54.52b	41.39b	7.75b
Grass	17.79b	4.60b	9.9a	2.1a	0.00	11.52c	67.74a	38.79b	4.59c

a, b, c means within column with different superscripts differ (P≤0.05).

Key Words: Indigofera hirsuta, Panicum maximum, Silage

T108 An evaluation of extended lactation as a strategy to alleviate reproductive loss in a seasonal pasture-based system. S. T. Butler*, L. Shalloo, and J. J. Murphy, *Teagasc Moorepark DPRC, Co. Cork, Ireland*.

This study was carried out to examine whether extending the calving interval to 24 months would be a viable alternative to culling and replacing cows that had failed to become pregnant during the breeding season. 46 non-pregnant lactating cows were assembled in late Nov 2004, paired on the basis of parity, days in milk, and previous milk production, and assigned to receive either 3 or 6 kg ('low' or 'high') concentrate and ad libitum grass and maize silage (50:50 mix) over the winter period (13 weeks). Cows were turned out to pasture in late March, and received 1 kg concentrate/day until dry-off (milk yield <5 kg /day). Cumulative milk production was calculated from calving to the end of Nov 2004 (normal period), and from the start of Dec 2004 until dry off in 2005 (extended period). Data were analysed using the MIXED procedure of SAS, with indoor feeding treatment and block in the model statement. High winter feeding resulted in greater (P<0.01) milk production over the winter indoor period (20.0 ± 0.3 vs. 17.8 ± 0.3 kg/day), and had a carryover effect of increased milk production through the end of lactation (5177 vs. 4686 kg during the extended period, P<0.05). At the end of the study period, cows (regardless of previous feeding) were ranked on the basis of cumulative milk solids, and separated into 3 groups (R1, R2, and R3). R1 produced 7287 (549) and 5738 (476) kg, R2 produced 6267 (466) and 4836 (393) kg, and R3 produced 5273 (391) and 4266 (350) kg milk in the normal and extended periods, respectively (milk solids in parentheses). Average lactation length was 593 days (range 475-677), was not affected by winter feeding, but was longer (P<0.05) in R1 and R2 than R3 (615 ± 10,609 ± 13, and 558 ± 13, respectively). 85% of the cows became pregnant during the breeding season of year 2, with a first service conception rate of 52%, and was not affected by either feeding treatment or rank. The results indicate that extended lactation may be a viable alternative to culling non-pregnant cows, and seems more suited to high producing cows.

Key Words: Extended lactation

Graduate Student Paper Competition: National ADSA Production Division Poster Competition

T109 Predictors of stillbirth for cows moved to calving pens when calving is imminent. J. Carrier*, S. Godden, J. Fetrow, S. Stewart, and P. Rapnicki, *University of Minnesota, St. Paul*.

The objective of this study was to identify predictors for stillbirth (SB) in cows moved from freestalls to a calving pen when calving is imminent (therefore interrupting the parturition process). The herd was a 2500-cow dairy where pre-fresh heifers and cows were kept in two separate freestall pens and moved to individual pens for calving. Cows fresh from 11/2003 to 2/2004 were included in the cohort, excluding twin births. Stillbirth was defined as death of a calf at calving or within 24 hours of calving. The advance of parturition immediately prior to moving was scored as (a) presence of only mucus or blood at the vulva, (b) presence of a "water bag" (allantochorion or amnion) or (c) presence of feet or head. The other predictors were parity (1 vs. 2+), total serum calcium concentration of the dam after calving (totCa), calf weight (CW, expressed as % of the dam's weight) and body condition score (BCS). Calving ease score (CE) was reported on a 5-point scale, later contracted to 3 levels of assistance (1: none, 2: light and 3+:

required). A total of 495 parturitions could be videotaped (277 heifers, 218 cows). There were 15% SB in the cohort. The risk of SB was modeled using multivariate logistic regression. Odds ratios (OR) adjusted for the other predictors are shown with 95% C.I. Stillbirth was not associated with BCS. Compared to unassisted calvings (CE1), the odds of SB were 2.9x higher for CE2 (1.4 to 6.0) and 46x higher for CE3+ (17 to 120). Stillbirth odds were reduced by 36% per 1% unit increase of CW relative to the dam (OR = 0.64, 0.47 to 0.89). Similarly, the odds of SB tended to be reduced by 22% per 1-mg/dL increase in totCa (OR=0.78, 0.57 to 1.06). The odds of SB were 5.2x higher for heifers vs. cows (2.2 to 12). Cows moved to a calving pen earlier (mucus only) were 2.5x more at risk of SB than those moved later with a "water bag" (1.0 to 6.0), but presence of feet was not different from the "water bag" stage. The fact that advance of parturition, parity and totCa remained in the model even after adjustment for CE could be due to a potential association with duration of calving, to be analyzed in another part of the study.

Key Words: Stillbirth, Parturition, Epidemiology

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T110 Effect of grains differing in expected ruminal fermentatibility on productivity of lactating dairy cows. C. Silveira*[1], M. Oba[1], J. Helm[2], and K. A. Beauchemin[3], [1]*University of Alberta, Edmonton, AB, Canada*, [2]*Alberta Agriculture Food and Rural Development, Lacombe, AB, Canada*, [3]*Agriculture and Agri-Food Canada, Lethbridge, AB, Canada*.

The objective was to evaluate effects of grains differing in expected fermentability in the rumen on dry matter intake (DMI) and productivity of lactating dairy cows. Twenty two multiparous and 9 primiparous lactating Holsteins cows (94 ± 29 d in milk; mean ± SD) were used in a 3 x 3 Latin square design with 21 d per period. Experimental diets contained either steam-rolled barley Dillon (BD), steam-rolled barley Xena (BX), or corn mix (CM; 87.5 % dry ground corn, 11.4% beet pulp, and 1.1% urea at DM basis; to match the starch and protein concentrations of BX) at 38% of dietary DM. Starch concentration was 50.0, 58.7, and 60.4% and in vitro 6-h starch digestibility was 73.5, 78.0, and 71.0%, respectively for BD, BX, and CM. All diets were formulated for 18.1% CP and 24.7% forage NDF. The DMI (23.6 vs. 21.6 kg/d; $P < 0.0001$), yields of milk (40.4 vs. 37.4 kg/d; $P < 0.002$), milk protein (1.20 vs. 1.12 kg/d; $P < 0.001$) and milk lactose (1.85 vs. 1.74 kg/d; $P < 0.006$) were higher for cows fed CM than for cows fed barley. Cows fed BX had higher yields of milk (38.5 vs. 36.2 kg/d; $P < 0.04$), milk protein (1.18 vs. 1.07 kg/d; $P < 0.001$) and milk lactose (1.80 vs. 1.69 kg/d; $P < 0.009$) than cows fed BD. However, milk fat concentration tended to be higher (3.47 vs. 3.23%, $P < 0.08$) for cows fed BD than BX. The DMI was not different between cows fed BX and BD (21.9 vs. 21.4 kg/d; $P < 0.35$). Differences in body weight were observed between cows fed BX and BD (-0.53 vs. 0.16 kg/d; $P < 0.001$). Greater milk production for cows fed CM compared with barley treatments might be attributed to expected slower starch digestion and greater DMI for CM. However, despite expected less ruminal fermentation, cows fed BD decreased milk production compared with BX, indicating that reducing starch digestion of barley grain may not improve productivity of lactating dairy cows.

Key Words: Barley, Starch digestibility, Dairy cows

T111 Plasma tumor necrosis factor-A concentrations during the transition period of cows fed at either ad libitum or restricted diet intakes during the dry period. L. A. Winkelman*[1], T. H. Elsasser[2], and C. K. Reynolds[1], [1]*The Ohio State University, Columbus*, [2]*USDA, ARS, Beltsville, MD*.

Tumor necrosis factor-α (TNF-α) is a pro-inflammatory cytokine that upregulates suppressors of cytokine signaling (SOCS) mRNA and induces nitric oxide (NO) production. Both SOCS and NO inhibit intracellular growth hormone (GH) signaling and uncouple the somatotropic axis. Liver TNF-α mRNA increases after calving in dairy cows, when GH signaling is disrupted. Plasma TNF-α concentrations in transition dairy cows have not been reported. The objective of this study was to measure plasma TNF-α, GH, and insulin-like growth factor-I (IGF-I) concentrations over the course of transition in dairy cows. Multiparous Holstein cows (n = 18), dried off 45 d before expected calving, were fed diets at either ad libitum (AL) or restricted (R) DMI until calving. The R diet was formulated to meet nutrient requirements at a DMI of 9.4 kg/d, while AL cows consumed 13.7 kg DM/d. Cows were fed the same diet ad libitum for 4 wk after calving. Coccygeal or jugular vein blood samples were collected weekly, with additional samples taken on days -18, -13, -9, -5, -2, +1, +4, and +7 relative to calving. Plasma TNF-α concentrations (pM) were unaffected by diet, but tended to be less ($P = 0.11$) after calving (5.02 vs. 4.77). Plasma GH concentrations (nM) were increased ($P < 0.01$) by R and were greater ($P < 0.01$) after calving for all cows (prepartum: 0.06 vs. 0.05; postpartum: 0.15 vs. 0.11, for R vs. AL). Plasma IGF-I concentrations (nM) were unaffected by diet before calving, but decreased ($P < 0.01$) after calving for all cows (prepartum: 13.28 vs. 12.87; postpartum: 9.84 vs. 8.21, for R vs. AL, respectively). During wk 1 postpartum, IGF-I concentrations were less ($P < 0.01$) for AL vs. R (7.49 vs. 10.13). If TNF-α is involved in the uncoupling of GH signaling after calving, its role is not readily explained by peripheral plasma changes. Regulation of TNF-α within the liver itself may be more important to understand its role in GH signaling.

Key Words: TNF-α, Transition, Dairy cow

T112 The effect of feeding increasing levels of dried distillers grains plus solubles to dairy cows in early lactation. B. N. Janicek* and P. J. Kononoff, *University of Nebraska, Lincoln*.

The objective of this experiment was to evaluate the effects of feeding increasing levels of dried distillers grains plus solubles (DDGS) on lactational performance of Holstein dairy cows. The hypothesis of this experiment was that increasing the levels of DDGS will decrease milk fat yield but not affect milk production or protein yield. Twenty multiparous Holstein cows averaging 76 ± 24 DIM and 638 ± 68 kg BW were randomly assigned to one of five 4 X 4 Latin squares. During each of the 28-d periods, cows were offered one of four dietary treatments. Based on the percent of diet dry matter, dietary treatments differed by the proportion of DDGS replacing both forage and corn grain. Dietary treatments were as follows 1) control, no DDGS, 2) 10% DDGS, 3) 20% DDGS, 4) 30% DDGS. Diets were formulated to be similar in crude protein (19%) and energy (1.74 Mcal/kg), but starch decreased with increasing levels of DDGS (24.5, 23.8, 23.3, and 23.0%). Dry matter intake increased ($P < 0.05$) linearly with increasing levels of DDGS (20.8, 21.8, 22.4, and 23.4 kg/d). Similarly, milk production tended ($P \leq 0.10$) to increase linearly (27.3, 28.5, 29.2, and 30.6 kg/d). Percentage of milk fat and protein did not differ across treatments, averaging 3.65 ± 0.16% and 3.17 ± 0.08% across experimental treatments. In comparison, fat yield tended ($P \leq 0.10$) to increase with increasing levels of DDGS (0.99, 1.03, 1.09, and 1.11 kg/d). Protein yield was not affected by dietary treatments, averaging 0.89 ± 0.05 kg/d. Milk urea nitrogen tended ($P \leq 0.10$) to decrease as the inclusion rate of DDGS increased (15.64, 15.21, 14.65, and 14.65 mg/dL). Milk fat yield did not decrease with increasing levels of DDGS while milk production tended to increase and protein yield remained unchanged. These results suggest that dairy diets may be formulated to contain DDGS at as high as 30% of the diet DM and may result in increased DMI and milk yield.

Key Words: Dairy cow, Distillers grain plus solubles, Lactation

T113 Gut peptide concentrations and dry matter intake in lactating dairy cows fed rumen-inert fats differing in degree of saturation. A. E. Relling* and C. K. Reynolds, *The Ohio State University, Wooster*.

Adding fat to lactating dairy cow diets often decreases DMI, but the extent of the decrease varies, in part due to the iodine value of the fat fed. Our objective was to determine the effect of feeding rumen-inert fats differing in degree of saturation on DMI and plasma concentrations of insulin, glucagon-like peptide 1 (GLP-1), glucose-dependent insulinotropic polypeptide (GIP), and cholecystokinin (CCK) in lactating dairy cows. Four mid-lactation, primiparous, Holstein cows were fed a control ration containing (DM basis) 17 % alfalfa haylage, 38 % corn silage and 45 % concentrate in a 4 X 4 Latin square design

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with 2-wk periods. Treatments were the addition of 3 rumen-inert fats at 3.5 % of ration DM comprised of mostly saturated (SFA), monounsaturated (MUFA) or polyunsaturated (PUFA) fatty acids. Hormone concentrations (pmol/L, Table 1) were measured in jugular vein plasma samples taken at 30 min intervals (15/d) on day 12 and 14. Feeding fat decreased DMI (d 11 - 14) and insulin concentration and increased GLP1 concentration, and the effect was greater for MUFA and PUFA vs. SFA. Feeding fat also increased CCK concentration, and the effect was greatest for MUFA. Degree of saturation determines the extent to which dietary fat decreases DMI in dairy cows, and the response is associated with changes in plasma concentrations of gut peptides.

Table 1. Dry matter intake and plasma hormone concentrations in lactating dairy cows fed rumen-inert fats.

Item	1 Control	2 SFA	3 MUFA	4 PUFA	SEM	$P <$ [1] 1 vs. 2-4	2 vs. 3,4	3 vs. 4
DMI, kg/d	23.8	23.1	22.1	22.0	1.1	0.042	0.115	0.725
GLP-1	27.8	29.6	32.9	31.9	1.7	0.004	0.036	0.527
GIP	499	590	570	534	63	0.004	0.129	0.181
CCK	10.0	12.6	15.9	13.8	1.6	0.001	0.017	0.040
Insulin	188	187	160	158	27	0.070	0.033	0.883

[1] Probability corresponding to effect of feeding fat (1 vs. 2-4), saturated vs. unsaturated fats (2 vs. 3, 4), or degree of unsaturation (3 vs. 4).

Key Words: Gut peptides, Rumen-inert fats, Saturation

T114 Chemical characterization, carbohydrate and protein subfractions, total digestible nutrients and estimated energy values of canola byproducts in ruminants. R. G. N. Heendeniya* and P. Yu, *University of Saskatchewan*, *Saskatoon, SK, Canada*.

The objective of this study was to determine chemical characterizations, evaluate nutritive values, in terms of protein and carbohydrate subfractions, total digestible nutrients and estimate energy content of a special canola byproduct from recent processing technology, in comparison with soybean and canola meal. The canola byproduct contained lower ($P<0.05$) ash, CP and true protein and higher ($P<0.05$) OM, CHO, NDF, ADF, lignin, ADIN and NDIN, compared with soybean and canola meal. 2) The canola byproduct contained 13.9, 12.8, 32.4, 16.0 and 24.9%CP for PA, PB1, PB2, PB3 and PC fractions, respectively. The protein subfractions are significantly different ($P<0.05$) from soybean which contained 4.1, 9.2, 77.8, 7.5 and 1.4%CP for PA, PB1, PB2, PB3 and PC, respectively. 3) Compared with soybean meal, the canola byproduct contained higher ($P<0.05$) tdNDF (4.7 vs 2.2%DM), lower ($P<0.05$) tdNFC (19.8 vs. 35.9%DM) and tdCP (27.8 vs 48.1%DM) and similar tdFA (0.5 vs 0.3%DM). 4) The canola byproducts contained lower ($P<0.05$) TDN1x (46.5 vs. 79.8%DM). 5) The energy contents estimated using a chemical approach from NRC-2001 were also different ($P<0.05$) between the canola product and soybean meal (DE3X: 2.16 vs. 3.72; ME3X: 1.73 vs 3.31 NEL3X: 1.03 vs.2.14; DE4X: 2.08 vs. 3.57; ME4X:1.64 vs. 3.16; NEL4X; 0.97 vs 2.03 Mcal/kg DM for dairy cattle and ME: 1.91 vs 3.30; NEm: 1.07 vs 2.27; NEg:0.52 vs 1.58 Mcal/kg DM for beef cattle). In conclusion, the canola byproduct had completely different chemical characterization, protein and carbohydrate fractions, total digestible nutrients and estimated energy values from soybean and normal canola meal.

Key Words: Canola byproducts, Nutritive value, Chemical characterization

T115 The impact of corn grazing on feed intake, milk production and grazing patterns of dairy cattle. B. J. McClenton*, G. B. Triplett, M. E. Boyd, A. Chapa, and T. R. Smith, *Mississippi State University*, *Starkville*.

To further investigate the use of corn grazing as a management tool for dairy producers, an 8-week trial was conducted to evaluate corn grazing effects on milk production, intake, activity and overall animal wellbeing of lactating dairy cows. Three groups of 18 cows were randomly allotted to treatments based on DIM, production and parity. Control (C) cows were housed in a traditional free-style barn and fed a balanced TMR ad libitum. Two Grazing (G) groups were allowed 24-hr access to 1.8-ha plots of ECOB Round Up-Ready Hybrid corn planted on April 19, 2005 at 79,000 seeds/ha and limit-fed TMR. Portable electric fences were used to progressively allow cows access to the grazing plots. Cow activity was monitored weekly by randomly selecting two cows per group and attaching handheld Global Positioning System units to the cow's collar. Cows began grazing on June 28, 2005 while the corn was still immature (R-2) and they consumed the entire plant. At week 3, G cows consumed an average of 12.6 kg/hd/d of the standing corn. As the plant matured and the nutrients redistributed, cows began eating less of the stalks and more of the leaves and ears. Once corn reached the dent stage, cows only ate ears. Intake of TMR by C cows averaged 24.5 kg of DM/hd•d^{-1} and was 23.9 ± 0.44% less in the grazing groups. Daily milk production averaged 25.3 kg/d for C cows and was similar for G cows over the entire trial. Grazing cows spent an average of 179 min/d grazing. Cows began grazing in the evening around 1830 when temperatures had cooled to 30°C and in the mornings cows grazed again from around 0630 till 0800 when temperatures approached 24°C. The time spent lounging was similar between groups, but G cows walked 4.4 ± 0.39 km/d, 3 times further than C cows. Corn grazing reduced the need for purchased commodities on the dairy while maintaining milk production and cow health. While distance traveled and grazing time are important considerations, corn grazing systems provide a viable management option for dairy producers. Research was supported by the Mississippi Agricultural and Forestry Experiment Station.

Key Words: Corn grazing, Dairy nutrition, Dairy management

T116 In situ rumen degradation kinetics of canola byproduct from recent processing technology: Comparison with soybean and canola meals. R. G. N. Heendeniya* and P. Yu, *University of Saskatchewan*, *Saskatoon, SK, Canada*.

The objective of this study was to determine in situ rumen degradation kinetics for dry matter (DM), crude protein (CP), neutral (NDF) and acid detergent fiber (ADF) of canola byproduct (CB) from recent enzymatic processing technology, compared with soybean (SM) and canola meal (CM). The parameters determined included soluble fraction (S), potentially degradable fraction (D), undegradable fraction (U), degradation rate of fraction D (Kd), lag time (T0), effective degradability (ED) and ruminally undegradable fraction (RU). The results show that the CB had significantly different degradation patterns from SM and CM ($P<0.05$). For DM, S was 7, 23, and 21% of DM, D was 45, 73, and 64% of DM; Kd was 9.85, 7.94, 8.99%/h, T0 was 0.2, 0.25, and 0.01 h; ED of DM was 35, 64, and 59% of DM for CB, SM, and CM, respectively. For CP, S was 6, 1, and 12% of CP, D was 55, 99, and 81% of CP; Kd was 15.04, 7.21, 10.95%/h, T0 was 0, 0.39, and 0 h; ED of CP was 45, 54, and 64% of CP; RUCP was 168, 211, 147 g/kg DM for CB, SM, and CM, respectively. For NDF, D was 33, 98, and 49% of NDF; U was 67, 2, and 51% of NDF; Kd was 9.03,

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5.94, 7.71%/h, T0 was 1.12, 0.86, and 1.52 h; ED of NDF was 20, 49, and 28% of NDF; ED of NDF was 109, 45, 65 g/kg DM for CB, SM, and CM, respectively. For ADF, D was 24, 100, and 42% of ADF; U was 76, 0, and 58% of ADF; Kd was 9.89, 5.31, and 9.08%/h, T0 was 1.78, 2.13, and 2.94 h; ED of ADF was 15, 47, and 25% of ADF; ED of ADF was 67, 29, and 48 g/kg DM for CB, SM, and CM, respectively. In conclusion, the CB rumen degradation characteristics differed from SM and CM, indicting the nutrient utilization and availability in the digestive tract are different.

Key Words: In situ degradation kinetics, Feed processing, Canola byproduct

T117 Ovulation rates and improved uterine health in cows fed Megalac®-R compared to Megalac®. B. E. Jones*[1], D. Fish[1], A. Martin[2], and R. L. Ax[1], [1]*University of Arizona*, *Tucson*, [2]*Dairy Veterinary Services*, *Chandler, AZ*.

A trial was designed to compare reproductive outcomes in a commercial dairy herd (approximately 2000 Holsteins) fed Megalac® (control) or Megalac®-R (Church and Dwight, Princeton, NJ). All cows were randomly assigned to be fed either product beginning at parturition and continuing until 150d postpartum (0.16 kg/d). Beginning 21d prepartum every cow received 0.11 kg/d of Megalac®. Cows were milked 4X for two months postpartum, and 2X until dryoff. Daily milk production (3.5% FCM) averaged 36.9 kg and 37.1 kg for Megalac® and Megalac®-R, respectively. To monitor ovarian status, real-time ultrasonography was utilized to examine a subset of cows at 2 wk and 4 wk postpartum. All ovarian structures on both ovaries were recorded. Results indicate within cow, numbers of follicles and their distributions in terms of follicular sizes were similar between treatments. However, 28/57 cows fed Megalac®-R had ovulated (49%) compared to 17/63 cows fed Megalac® (27%) by 30d fresh. The difference in ovulation frequency was statistically significant by Chi-square analysis. Prostaglandins were prescribed by the herd veterinarian as a uterine therapy. Within the first 60d postpartum, 38.9% of cows fed Megalac® and 29.0% of cows fed Megalac®-R required prostaglandin treatment, with this difference being statistically significant. The incidence of cystic ovaries was less than 3.0% in both treatment groups within the 60d comparison period. In summary, Megalac®-R contributed to improved uterine health and ovulation rates early postpartum compared to Megalac®.

Key Words: Ovulation, Uterus, Ultrasound

T118 Expression and regulation of glucose transporter gene expression in a bovine mammary epithelial cell line, Mac-T. K. A. Finucane*, A. F. Keating, and F. Q. Zhao, *University of Vermont*, *Burlington*.

After parturition, as the demand for lactose increases, the demand for the glucose precursor also increases dramatically. Mammary epithelial cells lack the glucose-6-phosphatase needed for glucose synthesis, and thus are dependent upon glucose transporters to take up glucose from the blood. For effective milk synthesis there must be sufficient transport of glucose across the plasma membrane of the mammary epithelial cell and to the Golgi vesicle for lactose synthesis. Studies have shown that a facilitative glucose transport process mediates mammary epithelial cell glucose uptake and the lactating bovine mammary gland expresses the facilitative glucose transporters GLUT1, GLUT8 and GLUT12. The mRNA expression of these transporters

increase from at least 5-fold to several hundred-fold in the transition from the late pregnant to early lactating stage, indicating that expression of these transporters may be regulated by the lactogenic hormones: insulin, glucocorticord and prolactin. To address this hypothesis, we have studied the expression and regulation of GLUT1, GLUT8 and GLUT12 *in vitro* using a bovine mammary epithelial cell line, Mac-T. RT-PCR studies confirmed expression of all three transporters in the Mac-T cell. Immunofluorescence staining showed that in the Mac-T cells, GLUT1 and GLUT8 proteins were distributed in both the cytoplasm and plasma membrane. Preliminary studies indicated that the expression of GLUT8 protein appears to be insulin responsive; GLUT8 expression increases with increasing amounts of insulin. Results of this study are the first to demonstrate that Mac-T cells express these glucose transporter proteins.

Key Words: Glucose transporter, MAC-T, Bovine

T119 Development and evaluation of a mechanistic model to predict liquid passage from the reticulo-rumen of dairy cattle. S. Seo*[1], L. Tedeschi[2], and D. Fox[1], [1]*Cornell University*, *Ithaca, NY*, [2]*Texas A&M University*, *College Station*.

A mechanistic and dynamic model was developed to quantitatively predict the dynamics of liquid flows in the reticulo-rumen (RR) of cattle. The model was composed of two inflows (water consumption and salivary secretion), one outflow (liquid flow through the reticulo-omasal orifice), and one in and out flow (liquid flux through the rumen wall). We assumed liquid flow through the reticulo-omasal orifice (ROO) is coordinated with the primary reticular contraction, which is characterized by its frequency, duration and amplitude during eating, ruminating and resting. A database was built to predict each component of the model. A random coefficients model was used with the MIXED procedure of SAS with studies as a random variable to identify significant variables. The parameters were estimated using the same procedure only if a random study effect was significant; otherwise the GLM procedure was used. Total water consumption was estimated as $4.893 \times DMI$, and 20% of drinking water was assumed to by-pass the RR. Salivary secretion was estimated to be 210 g/min during chewing. During ruminating, however, the rate was assumed to be adjusted for the proportion of liquid in the rumen. Resting salivation was exponentially related with DMI. Liquid efflux through the rumen wall was assumed to be the mean value of the database (4.6 kg/h). Liquid outflow through the ROO was estimated for each chewing behavior. The input variables for the model are DMI, BW, dietary DM, concentrate content in the diet, time spent eating and time spent ruminating. When compared with 28 observations in 7 experiments, the model accounted for 40, 70 and 90% of the variation with root mean square prediction errors of 9.25 kg, 1.84 kg/h and 1.3%/h for liquid content in the rumen, liquid outflow rate and fractional rate of liquid passage (Kpl), respectively. Sensitivity analysis showed that DMI, followed by BW and time spent eating, are the most important input variables for predicting the dynamics of liquid flow from the rumen. We conclude this mechanistic and dynamic model can be used to accurately predict Kpl in dairy cattle.

Key Words: Liquid passage rate, Ruminal liquid dynamics, Modeling

T120 Immune response in dairy cows fed fish oil and condensed corn distillers solubles. M. Bharathan*, D. J. Schingoethe, R. S. Kaushik, K. F. Kalscheur, A. R. Hippen, and G. Moorkanat, *South Dakota State University, Brookings.*

Dietary fatty acids are known to modulate immune response in animals and humans. To assess the influence of dietary fatty acids on immune response, 12 lactating Holstein dairy cows were randomly assigned to one of four dietary treatments which included control (D1), control with 0.5% fish oil (D2), 10% condensed corn distillers solubles (CCDS) supplying 2% fat (D3), and 10% CCDS with 0.5% fish oil (D4). Cows were fed individually as TMR once daily for ad libitum consumption for 28 d. Blood samples were collected on d 0, 7, 14, 21 and 28 to isolate peripheral blood mononuclear cells (PBMC). The proliferation responses of PBMC on d 0, 14, 21 and 28 when stimulated in vitro with mitogens, concanavalin (ConA), phytohemagglutinin (PHA) and lipopolysaccharide (LPS) were measured using Brdu proliferation kit. There were no differences (P>0.05) among treatments over time for proliferation assays compared to D1. Percentages of cells and mean fluorescence intensity resulting from immunolabelling for bovine leukocyte markers CD3, CD4, CD8, CD14, CD21, MHC classII, and $\gamma\delta$T cells were determined on 20,000 PBMC using a FacsCalibur on d 0, 7, 14, 21 and 28. There was a trend (*P*<0.09) for decreased number of CD3+ cells; however CD4+ and CD8+ cells decreased (*P*<0.03) with cows fed D4 compared to D1. Cows fed D2 and D3 had lower (*P*<0.05) CD4+ cell numbers compared to D1 but there was no difference for CD8+ cells. The percentage of CD21+ cells were similar across diets (28.8, 31.7, 30.4 and 36.9%; *P*>0.10). CD14+ cells increased (*P*<0.02) and MHC classII+ cells showed an increasing trend (51.5, 59.4, 60.7 and 75 %; *P*<0.08) with D4 compared to D1. There was an increase in the number of $\gamma\delta$T cells (*P*<0.01) in D3 but no differences were observed with D2 and D4 compared to D1. Since there was a decrease in CD3+, CD4+, and CD8+ cells, this may lower the T-cell mediated immunity in D4 fed cows. Increased CD14+ cells and the trend of increasing MHC classII+ cells suggest that D4 may enhance the antigen presentation and innate immunity in lactating dairy cows.

Key Words: Immune response, Fish oil, Condensed corn distillers solubles

T121 Preliminary validation of an on-farm culture system. A. Lago*[1], S. Godden[1], R. Bey[1], K. Leslie[2], R. Dingwell[2], P. Ruegg[3], and L. Timms[4], [1]*University of Minnesota, St. Paul,* [2]*University of Guelph, Guelph, ON, Canada,* [3]*University of Wisconsin, Madison,* [4]*Iowa State University, Ames.*

There is increasing adoption of on farm culture systems for selective treatment of clinical mastitis cases. They may also be useful for the diagnosis and selective treatment of subclinical intramammary infections in fresh cows. We present preliminary validation of an on-farm culture system (Minnesota Easy Culture System II). Farm personnel collected milk samples from clinical mastitis quarters, and from fresh cow quarters that tested positive using the Californian Mastitis Test (CMT) within three days after calving. The fresh samples were then plated on farm using a sterile cotton swab onto each half of a bi-plate. Plates were incubated overnight and then interpreted as 'no growth', when bacteria did not grow, or 'Gram-positive' or 'Gram-negative' depending if growth was on the Factor or the MacConkey

media half of the bi-plate respectively. After plating, milk samples were frozen and later cultured in the laboratory using standard identification procedures. On farm culture results and corresponding in laboratory results are available from 80 quarter cases of clinical mastitis, and from 87 fresh cow CMT positive quarters. Using the on-farm culture method for clinical mastitis cases, producers were able to detect 83% of the Gram-positive cases (sensitivity), and classified correctly about 90% of the Gram-negative cases or cases where bacteria was not present (specificity). Consequently, 83% of the treated cases, 'Gram-positive' quarters underwent intramammary treatment, were truly Gram-positive (predictive value of a positive test; PV+), and 90% of the not treated cases, 'Gram-negative' or 'no growth', were truly uninfected or Gram-negative (predictive value of a negative test; PV-). For fresh cow CMT positive quarters, the sensitivity of the on-farm culture to detect gram-positive quarters was 88%, and the specificity was 70%. Accordingly, 80% of the treated cases were truly gram-positive (PV+), and 81% of the not treated cases were truly uninfected or Gram-negative (PV-).

Key Words: On farm culture, Bi-plate, Mastitis

T122 Effects of rumen protected choline and dry propylene glycol on production performance and blood metabolites of periparturient Holstein dairy cows. Y.-H. Chung*[1], I. D. Girard[2], P. Cavassini[3], and G. A. Varga[1], [1]*The Pennsylvania State University, University Park,* [2]*Probiotech International Inc., Québec, Canada,* [3]*Ascor Chimici s.r.l., Via Piana, Italy.*

Effects of supplementing rumen protected choline (RPC; 50% choline as choline chloride) and dry propylene glycol (PG: 65% purity) to periparturient Holstein dairy cows were studied utilizing a 2x2 factorial treatment arrangement. Sixty-three multiparous cows (average lactation number = 2.3 ± 0.2) were blocked according to criteria before entering the trial. Beginning at 20 d (± 0.3d) before the expected calving date, cows were top dressed with 0 or 50g RPC/cow/d. After parturition, half of the cows from each RPC group were additionally supplemented with 250g dry PG/cow/d mixed into the TMR until d 21 postpartum. Tail vein blood was sampled at -21, -14, -8, -5, -3, -1, +2, +7, +14 and +21 d (± 0.2 d) relative to calving. Pre- and postpartum data were analyzed separately as repeated measure using MIXED procedure of SAS. Dry matter intake, as % of body weight, tended to increase with dry PG supplementation (*P* = .12). Variability in prepartum blood NEFA was reduced for cows supplemented with RPC (*P* = .11) as they neared parturition. Changes in postpartum blood BHBA (*P* = .02) and urine ketones (*P* = .02) were significantly affected by the interaction of RPC and dry PG overtime. Dry PG appeared to reduce blood BHBA (9.4 vs. 7.4 mg/dL for 0 and 250g dry PG without RPC, respectively) but this reduced effect seemed to be blocked by RPC (9.2 vs. 9.2 mg/dL for 0 and 250g dry PG with RPC, respectively). Urine ketone values were highly correlated with blood BHBA. Milk production did not differ across treatments. Milk fat % tended to increase with RPC supplementation (*P* = .14). Collectively, RPC and dry PG each had influences on blood metabolites via different mechanisms and through interactions with each other. Individual or additive effects of RPC or dry PG did not elicit any production responses likely due to a relatively positive energy balance based on pre and postpartum BHBA and NEFA values.

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