stress during behavioral estrus interrupts the terminal stages of follicle development and delays the preovulatory surge of LH and ovulation.

Key Words: Endotoxin stress, Delayed ovulation, Sheep

1215 The effects of a chronic elevation in plasma insulin during the early postpartum period on luteinizing hormone pulsatility and plasma estradiol in dairy cows. S.T. Butler* and W.R. Butler, *Cornell University, Ithaca, NY.*

Early lactation in dairy cattle is associated with a prolonged period of anestrous due to attenuated pituitary LH release and impaired ovarian LH responsiveness. Using the hyperinsulinemic-euglycemic clamp technique we previously demonstrated that an 8-fold increase in plasma insulin resulted in a marked decline in DMI in early lactation cows (2001; J. Dairy Sci. 84 (Suppl. 1): 34), thus negating any potential benefits on LH pulsatility and LH responsiveness. We have conducted another clamp experiment with a more moderate increase in plasma insulin to determine if alterations in LH pulsatility or responsiveness could be observed. Holstein cows (n=10) were subjected to either a hyperinsulinemic-euglycemic clamp (INS) or saline infusion (CTL) for 96-hours starting on day 10 postpartum. Insulin was infused continuously (0.3 μg/kg BW/hr) via a jugular catheter. Blood samples were collected hourly, and euglycemia was maintained by infusion of exogenous glucose. During infusion, insulin concentrations were increased 2.3-fold in INS cows over those in CTL cows (0.70 $\pm$ 0.05 vs. 0.30 $\pm$ 0.05 ng/ml; $P<0.001$), while blood glucose concentrations were not different between treatments. Blood samples were collected at 10 minute intervals for 8 hours immediately prior to commencement (PRE) and termination of infusions (END). In addition, 10 minute blood samples were collected from INS cows for a further 8 hours immediately following the commencement of the insulin infusion (START). Relative to values measured during PRE, the number of LH pulses, pulse amplitude and mean LH were not different ($P>0.05$) during END for either treatment or during START for the INS cows. Plasma estradiol levels declined in CTL cows during the infusion period, but increased in the INS cows following the onset of insulin infusion (treatment x time, $P<0.001$). The results indicate that insulin is an important metabolic hormone for determining ovarian responsiveness to LH, but do not implicate a role for determining LH pulsatility.

Key Words: Luteinizing hormone, Estradiol, Insulin

1216 Effects of GnRH administered at onset of estrus on endocrine responses and conception in lactating cows. M. Kaim[1], A. Bloch[2], D. Wolfenson*[2], M. Rosenberg[1], H. Voet[2], and Y. Folman[1], [1]*Agricultural Research Organization, Bet-Dagan, Israel,* [2]*Hebrew University, Rehovot, Israel.*

Two studies examined the effects of GnRH injection at onset of estrus on LH surge, progesterone concentrations, interval to ovulation, and conception rates, in Holstein cows. In study I, cows were monitored for estrus, blood samples were taken, and ovulation was checked by ultrasound. Treated (n=24) and control (n=25) cows were injected with GnRH analogue (Buserelin, 10 mg) or saline at onset of estrus. 19 control cows had a normal estrus-ovulation (E-O) interval (<30 h) and 6 (24%) had a long interval (>30 h). All GnRH-treated cows had a normal E-O interval (26.10.5 h). GnRH-treated cows showed a higher LH surge than control cows ($P<0.05$). Control cows with a long E-O interval had lower preovulatory estradiol ($P<0.05$), and progesterone levels in the subsequent mid-luteal phase were about 2 ng/ml lower ($P<0.05$) than in control cows with a normal E-O interval and GnRH-treated cows. In study II, in summer and winter, 152 primiparous and 211 multiparous synchronized cows at 60-100 days post-partum were used. Estrus was monitored frequently, and randomly assigned GnRH-treated cows were injected, as above, within 2.5 h of onset of estrus. Overall, in both seasons, conception rates (first 2 inseminations) of multiparous cows did not differ between groups, whereas that of GnRH-treated primiparous cows was higher than that of control cows (42.2 and 63.2%; $P<0.05$). GnRH increased conception rates in cows with low body condition (BCS; 36 vs 62%, $P<0.05$). In summer, conception rates of 31% of all control primiparous cows and of multiparous cows with low BCS, were increased to 56% by GnRH ($P<0.05$). In winter, GnRH was less effective. Results suggest that administration of GnRH at estrus is likely to shorten long E-O intervals and to increase low P4 post-ovulation in cows exhibiting a low preovulatory LH surge; these changes could be associated with fertility improvement by GnRH, mainly in cows with low BCS and in the summer season.

Key Words: GnRH at estrus, LH surge, Fertility

Production, Management, and the Environment
Dairy Management

1217 Non-nutritional factors that influence milk urea nitrogen concentration. P.M. Meyer*[1], P.F. Machado[1], A. Coldebella[1], C.H. Corassin[1], L.D. Cassoli[1], and P.H.M. Rodrigues[2], [1]*Clinica do Leite. Escola Superior de Agricultura Luiz de Queiroz/University of Sao Paulo, Brazil,* [2]*Faculdade de Medicina Veterinaria e Zootecnia, University of Sao Paulo, Brazil.*

The purpose of this study was to determine which non-nutritional factors have most influence on milk urea nitrogen (MUN) and further to establish targets concentration. Data from approximately 500 Holstein cows were collected for 10 months (n=5082) from a farm in Sao Paulo state (Brazil). Factors studied were: milk production (MP), days in milk (DIM), lactation number (LN), somatic cells count (SCC) and milk fat (F), protein (P), lactose (L) and total solids (TS) percentage. The association of MUN concentration (dependent variable) and the other variables studied (independent variables) was estimated using the multiple linear regression analysis. To identify among independent variables those that could best explain variability in MUN concentration, coefficients of determination (R^2) and adjusted coefficients of determination were estimated for the several equations. Maximum R^2 obtained was 0.1285, when all independent variables were included in the model, which can be considered low. The highest R^2 value found was for MP (R^2= 0.0987), which indicates that MP explains 9.9% of the total variability of MUN. The other variables studied are responsible for the remaining 2.9% of the variability. It was concluded that the best factor to correct MUN target, among the ones studied, is MP. Financial support: FAPESP and CNPq (Brazil). Table. Coefficient of determination (R^2) of multiple linear regression analysis for maximum R^2 in the model, using MUN as dependent variable.

Variables included	R^2	Adj. R^2
MP	0.0987	0.0985
MP, P	0.1113	0.1109
MP, P, L	0.1139	0.1134
MP, P, L, CCS	0.1160	0.1153
MP, P, L, CCS, ST	0.1180	0.1171
MP, P, L, CCS, ST, F	0.1259	0.1249
MP, P, L, CCS, ST, F, DIM	0.1282	0.1270
MP, P, L, CCS, ST, F, DIM, LN	0.1285	0.1271

Key Words: MUN, dairy cows, target concentration

1218 Relationship among having mud in milking-cow barns, somatic cell counts and decreased milk yield in Thai dairy herds. W. Suriyasathaporn*[1], P. Maneeratanarungroj[1], S. Sangmaneedej[1], P. Tungtanatanich[1], S. Takong[1], U. Parinyasutinun[2], and S. Pangjuntuk[2], [1]*Faculty of Veterinary Medicine, Khonkean University, Thailand,* [2]*Dairy Farming Promotion Organization of Thailand.*

The objective of this study was to evaluate relationship among having mud in milking-cow barns, somatic cell count, and milk yield in Thai dairy herds. Milk samples were collected from 78 dairy cows from 6 small dairy holders in the Northeast Thailand, a tropical country where a difference of temperature among seasons is relatively small. Farm environment, individual milk yield, calving date, and parity of the cows were recorded. Characteristics of the barns in this study were loose housing with ground floor, partial roof, and no wall. Each farm was

visited 4 times during the study. Somatic cell count (SCC) in the milk samples was measured using Fossomatic® (Foss-electric, Denmark) and then transformed to logarithmic scale in order to obtain normally distributed data. Repeated measures analysis (general linear mixed model) was used to evaluate relationships of having mud in the barns to SCC and milk yield of individual cows. Independent variables included in the model were month in milk, parity, and having mud in cattle barns. The free entering method was used and the restricted maximal likelihood was calculated to identify significant levels. The number of farms having mud in cattle barns in September, October, November, and December was 6, 4, 0, and 0 farms, respectively. The average test day milk yield on each of the four farm visits was 13.5, 13.1, 14.6, and 14.7 kg/day, respectively. Stepwise forward regression analysis showed that only having mud in cattle barns was associated with increased SCC ($P < 0.01$). The factors associated with test day milk yield were month in milk, parity, and log SCC. Milk yield was peaked during the second month of lactation, and declined significantly during the following months. Milk yield of a heifer was less than that of a cow. The increase of SCC was associated with decreased milk yield. No effect of having mud in cattle barns on milk yield after adjusting for log SCC was observed. The study concluded that having mud in cattle barns may result in increased SCC and consequently decrease milk yield.

Key Words: Mud, Somatic cell count, Milk yield

1219 Interpretation of protein-energy balance of feeding by milk urea nitrogen and milk protein contents of lactation Holstein cow in Korea. J. S. Moon*[1], Y. S. Joo[1], G. C. Jang[1], J. M. Kim[1], B. K. Lee[2], B. W. Yoo[2], and Y. H. Park[3], [1]*National Veterinary Research and Quarantine Servie, MAF,* [2]*Agrigrands Purina Korea, Inc.,* [3]*College of Veterinary Medicine and School of Agricultural Biotechnology, Seoul National University*.

Milk data including milk protein (MP), milk urea nitrogen (MUN) are being used as indicators of the protein-energy balance and for actual farm feeding practices. The purpose of this study was to investigate the MUN and MP concentrations of individual and bulk milk by month and by region and to evaluate the protein-energy balance for feeding according to the level of MP and MUN by stage of lactation in Holstein cows. MP and MUN contents were determined using automated infrared procedures. Mean MUN and MP concentrations in the bulk milk samples obtained from 128,997 cows of 4,731 herd during Jan., 1999 to Dec., 2001 were 15.9?4.2 mg/dl and 3.30?0.18%, respectively. The highest values were found during spring and lowest valued during winter in MUN. But, the average contents of MP were the highest during winter and the lowest during summer. Of total herds surveyed, 10.7% had MUN values lower than 12.0 mg/dl and 39.7% had values higher than 18.0 mg/dl and 53.0% of total herd have not met with standard criteria of MP values. In order to evaluate protein-energy balance for feeding, we determined the level of standard range for MP as 2.90?3.29% in early lactation considering dairy cows to experience a negative energy balance. The level of MP in mid-lactation and late lactation were determined as 3.10?3.49%, and 3.30?3.69%, respectively. Standard MUN of 12?18 mg/dl was determined through the whole lactation period. Milk yield, body condition score and milk composition were analyzed by the 9 types based on the levels of MP and MUN. The lower body condition score was associated with low MP, high MUN content and decreased milk yield. Among the total herds investigated, 26.8%, 25.8%, and 22.2% have shown the standard criteria of MP and MUN values, respectively. The study has indicated many diary farms in Korea showed variable MP and MUN values by herd, season and individual physical condition.

Key Words: Milk Urea Nitrogen, Milk Protein

1220 Effect of duration of sequential teat cleaning by two rolling brushes on milking characteristics in a single stall automatic milking system. A. Dzidic[1] and R.M. Bruckmaier*[1], [1]*Institute of Physiology, Tech. Univ. Munich - Weihenstephan, Freising, Germany*.

In automatic milking systems (AMS) teats are cleaned by water, towel or brush. The stimulatory effect of teat cleaning induces milk ejection. The goal of this study was to evaluate the effect of the number of cleaning cycles on milking characteristics in forty-eight German Fleckvieh cows milked in a single stall AMS (Merlin, Lemmer-Fullwood). Cows were randomly assigned to the treatments B0 (no brushing), B1 (1 brushing cycle for 16 s, 4 s per teat), B2 (2 brushing cycles), B4 (4 brushing cycles) and B6 (6 brushing cycles). Each treatment period lasted for two days. Quarter milk yield and milk flow was recorded during milking. Time needed for attachment of all four teat cups was similarly short in all treatments (19 to 23 s). Total milk yield and milk production rate (kg/h) did not differ between treatments. Milking time was prolonged ($P<0.05$) in all quarters in B0 as compared to the other treatments. Time from the start of cleaning until the end of milking was 6.8±0.2, 6.4±0.2 and 6.6±0.2 min with 0, 1 and 2 cleaning cycles respectively, i.e. 1 and 2 cleaning cycles reduced the total time required for milking. Milking time was shorter in front (4.4±0.1 min) than in rear quarters (5.6±0.1 min). Peak and average milk flow rates were lower ($P<0.05$) in B0 than in all other treatments. Two cleaning cycles resulted in the highest peak flow rates (3.0±0.1 kg/min) as compared to the other treatments. In conclusion, duration of teat cleaning in AMS had a crucial influence on milking characteristics (milking time, peak and average milk flow rate). Optimal milk removal in most cows was observed after two cleaning cycles i.e. a pre-stimulation time of 32 s.

Key Words: Milking characteristics, AMS, Pre-stimulation

1221 Effects of manure handling systems on volatile nitrogen loss from dairy manure. V.R. Moreira*[2] and and L.D. Satter[1,2], [1]*U.S. Dairy Forage Research Center USDA-ARS,,* [2]*Dairy Science Department, University of Wisconsin, Madison*.

The objective was to evaluate the effect of manure handling systems on nitrogen (N) loss from dairy manure. The nitrogen to phosphorus ratio (N:P) in manure was used as the basis of system comparison. N:P in dairy manure at time of excretion is likely to range between 6-7. As N is volatilized from manure, the N:P is reduced, since P does not volatilize. This assumes neither N nor P is lost due to runoff during collection and storage of manure. A set of 778 manure analyses from four laboratories located in MN, OH, PA, and WI was used. Individual analyses within laboratory source was used as error term, and samples deviating more than 2.5 x SDM were deleted from each laboratory data set. Manure storage systems from PA and WI were identified as earthen basin (EB), daily haul (DH), bedded pack (BP) and stack (S). EB (N:P=5.37, n=183) had higher ($P\leq.004$) N:P than BP (4.53, n=30), but did not differ from DH (5.12, n=77, $P\geq.25$) or S (4.64, n=9, $P\geq.14$). No differences were found between bedding type (inorganic vs. organic, n=53 and 71, $P\geq.36$) in WI samples, or covered and uncovered storage (n=10 and 35, $P\geq.99$) in PA samples. Method of loading manure into slurry storage (bottom loading vs. top loading) from PA samples affected N loss, with bottom and top loading having N:P of 5.35 and 4.73 (n=27 and 51, $P\leq.02$). Manure samples submitted for analyses during the summer (4.90, n=107) or fall (4.67, n=240) had a lower N:P (spring, 5.05, n=267; winter, 5.61, n=132). If we assume an average N:P of 6.5 in dairy manure at time of excretion for samples analyzed by these commercial laboratories, then N losses from time of excretion until removal of manure from storage ranged between 2-36%. Based on manure sampled from 7 dairy farms in WI, and information about the diets fed on these farms, excreted N:P was estimated to be 6.78±0.88. Manure sampled from these farms in the spring of 2001 when storage facilities were being emptied indicated that N losses ranged from 4% (twice daily free stall scraping with DH) to 23.5% (twice daily free stall scraping and top-loading of a 2-3wk storage pit).

Key Words: Nitrogen, Phosphorus, Manure

1222 An evaluation of the cost of feeding dairy cows in Ragusa, Italy. G. Azzaro*[1], D.T. Galligan[2], J.D. Ferguson[2], R. Petriglieri[1], S. Carpino[1], and G. Licitra[3], [1]*Consorzio Ricerca Filiera Lattiero-Casearia, Ragusa, Italy,* [2]*University of Pennsylvania,* [3]*University of Catania, Italy*.

Fifteen farms were visited to collect feeding management and production data. For lactating and dry cows, each feed ingredient fed, its amount (kg/d) and cost (#/kg) were recorded. General herd information regarding average herd size, production/cow/day, average milk price, milk fat%, milk protein% were also recorded and all data were stored in an Excel data base. An index of the marginal cost of milk production was calculated within each farm by using the dry cow ration cost/day as an estimate of maintenance cost and the ration cost for the production realized. Forage ration cost was on average 44% (STD = 6) of the valued milk production. The average marginal cost of milk production was 0.12 #/kg, (STD =42). Average lactation ration cost was

5.31 #/cow/d (STD= 0.63) with an average production of 30.7 kg/d. A correlation analysis was done on monitored and calculated variables. Lactating ration costs were positively correlated with forage costs (.62), marginal costs of milk production (.65), and milk price (.58). Herd size was weakly correlated with marginal cost of milk production (.10) but strongly correlated with milk price (.51). Milk production (kg/d) was moderately correlated (.46) with forage ration cost and average herd size (.41) and mildly correlated with total lactating ration cost (.32). This index of the marginal cost of milk production can be easily calculated on most dairy farms in Ragusa.

Key Words: Marginal costs, Ration cost, Economics

1223 Environmental stress on N'Dama cattle raised in tropical conditions and its implications on production and traditional management. P. Ezanno*[1], A. Ickowicz[2], and P. Lecomte[1], [1] *CIRAD-EMVT, Montpellier, FRANCE,* [2] *CIRAD-EMVT, ISRA-LNERV, Dakar, SENEGAL.*

Under the tropics, cattle are traditionally raised on rangelands. Environmental stress is principally due to climate, which is strongly seasonally marked. In Kolda area (Senegal), the rainy season (RS) mostly occurs from June to October (950 mm), resulting in seasonal forage, water availability and recurrent health problems, such as high pressure in parasites during the RS or feed shortage in late dry season (DS). As a local breed, N'Dama cattle is well-adapted to its environment and relatively tolerant to heat, humidity and local diseases. However, input technologies are low under traditional management with few veterinary interventions, no artificial insemination and no supplementary feeding. Hence, the seasonal environment sharply influences calves growth, cow milking and herd management. A survey has taken place on 3 herds (165 cows) from one village in Kolda area from 1993 to 1996 to study cattle herd routes, seasonal use of land components and performances. Botanical composition of the forage diet varies over year: cattle are mostly fed in the forest-savannah in RS and harvesting period (82% and 95% of crossing time (ct), respectively); during the DS they use crops residues and fallows (75% of ct). Moreover, quality of the diet and forage intake influence body condition score and milk production. Whereas reproduction is not controlled, calving does not take place all year round. It principally occurs between July and October, also strongly related to cows body condition status (GLM; $p<0.001$). This results in a decrease in milk production as only a few calving occur and body condition is not high enough to allow fat mobilisation in early lactation. Milk being the principal source of animal protein for farmers, their strategies are also related to environmental stress. Hence, to bridge the gap between late RS and harvesting, they sell then unproductive cows or bulls and buy young ones during the good season, which is not economically interesting. Low input technologies as rational supplementation could alleviate these stress and result in a better distribution of productions among seasons.

Key Words: Tropical Environment, N'Dama Cattle, Seasonal Productions

1224 Effect of β-carotene supplementation on milk yield and reproductive function of Holstein cows exposed to heat stress in a semiarid environment in northern Mexico. R. Rodriguez-Martinez*[1], P.A. Robles-Trillo[1], G. Castillo[2], R. Bañuelos-Valenzuela[3], and C.F. Arechiga[3], [1] *Universidad Autonoma Agraria Antonio Narro-UL,* [2] *Syntex-Roche,* [3] *Universidad Autonoma de Zacatecas.*

A total of 339 Holstein cows [Multiparous (M, n=131); Primiparous (P, n=208)] were included in a study to determine the effect of β-carotene supplementation on productive and reproductive function of dairy cows exposed to heat stress in a subtropical-semiarid environment in Mexico (26 NL), Cows were assigned randomly to one of two groups: 1) Control (n=179), receiving a total-mixed ration (TMR) for lactating cows or 2) β-carotene (n=161), receiving 400 mg/d of supplemental β-carotene in addition to TMR from parturition throughout 90 days postpartum (PP). The TMR, based on chopped alfalfa, corn silage, and a concentrate-mineral mix, was offered twice daily; access to fresh water and shade was ad libitum. Blood samples were collected from tail-vein puncture to evaluate progesterone (P4) concentrations on d 0, 30, 60 and 90 days PP. Reproductive variables included open days, days to first service, number of services per conception, vaginal discharges (i.e., clean or dirty), pregnancy rate at 60, 90, 120 and 150 d PP, and culling rate. Continuous variables were analyzed for M- and P-cows through linear-general models using a split-plot design which evaluated the effect of treatment (β-carotene vs. Controls) upon productive and reproductive parameters. Categorical data were analyzed by Chi-square. Neither milk yield nor P4 levels, were different between treatments ($P>0.05$) at any measurement period or for any physiological status (M or P). For M, there was a trend ($P>0.05$) forβ-carotene to reduce the number of days open (126 vs. 140 d) and increase cumulative pregnancy rate at 150 d PP (59 vs. 48%). For P, β-carotene caused a greater proportion of cows to have clean vaginal discharges at first estrus (80.6 vs. 59.6%; $P<0.001$) and more pregnant cows ($P<0.05$) between 120 and 150 d PP (15.2 vs. 9.1%). The cumulative pregnancy rate at 150 d PP was 81.8 vs. 79.8% for β-carotene vs. control ($P>0.05$). β-carotene reduced culling rate ($P<0.05$) for both P- and M (P= 46.2 vs. 53.9%; M=43.7 vs. 56.3%), and there was also a slight increase in total cumulative pregnancy rate (70.4 vs. 64.2%) ($P>0.05$). These results could be of economical significance for dairy producers.

Key Words: Dairy Cow, Heat Stress, Mexico

1225 The level of inbreeding of Senepol bulls in a closed herd in the US Virgin Islands. R.W. Godfrey* and R.E. Dodson, *Agricultural Experiment Station, University of the Virgin Islands.*

The effect of inbreeding coefficient (IC) on the results of Breeding Soundness Evaluation (BSE) exams was determined in Senepol bulls from a closed herd on St. Croix. Bulls were evaluated at 12, 16, 20 and 24 mo of age using the BSE over a 2-yr period and given a rating of satisfactory or unsatisfactory based the BSE guidelines. The number of bulls tested was 214, 92, 40 and 20 at 12, 16, 20 and 24 mo of age, respectively. The number of sires represented at each age was 10, 11, 13 and 12 for 12, 16, 20 and 24 mo old bulls, respectively. The decrease in number of bulls as age increased was due to culling. Data were analyzed using GLM and chi-squared procedures of SAS. The IC of bulls tested at 12, 16, 20 and 24 mo was 2.6 $\pm$ 0.2, 2.6 $\pm$ 0.3, 2.7 $\pm$ 0.4 and 2.6 $\pm$ 0.6 %, respectively. The proportion of bulls receiving a satisfactory BSE increased ($P < 0.0001$) with age (1.9, 23.9, 30.0 and 40.0 % at 12, 16, 20 and 24 mo, respectively). There was no difference ($P > 0.10$) in IC between bulls receiving a satisfactory or unsatisfactory BSE rating at any age. There was a difference in IC among sire lines at 12 ($P < 0.001$) and 16 ($P < 0.0007$) mo but not at 20 and 24 mo. Scrotal circumference was different among sire lines at 12 ($P < 0.0006$), 16 ($P < 0.02$) and 24 ($P < 0.004$) mo but not at 20 mo. Paired testes volume was different among sire lines at 12 ($P < 0.001$), 16 ($P < 0.07$) and 24 ($P < 0.002$) mo but not at 20 mo. The proportion of bulls having uneven or missing testicles was 4.2 and 4.3 % at 12 and 16 mo of age. There were no bulls at 20 or 24 mo of age with missing or uneven testicles. Sperm motility was negatively correlated with IC in 12 ($R = -.69$, $P < 0.04$) and 20 ($R = -.36$, $P < 0.05$) mo old bulls. Scrotal circumference was negatively correlated ($R = -.44$, $P < 0.05$) with IC in 24 mo old bulls. These results indicate that the low level of inbreeding in a closed herd of Senepol cattle did not have any detrimental effects on the breeding potential of the bulls as evaluated using the BSE.

Key Words: Bull, Inbreeding, Testes

1226 The efficacy of a reduced dose of GnRH on ovulation rate and time of ovulation in Jersey and Holstein dairy cows. A. Ahmadzadeh[1], R. Manzo*[1], C. B. Sellars[1], L. E. Palmer[1], and R. L. Nebel[2], [1] *University of Idaho, Moscow, ID,* [2] *Virginia Tech, Blacksburg, VA.*

To decrease the cost of artificial insemination (AI), a reduced dose of GnRH has been utilized in timed AI. However, the efficacy of the lower dose of GnRH on ovulation rate and time of ovulation relative to GnRH administration may differ between Jersey (JE) and Holstein (HO) cows. The objectives were to determine the effect of reduced dose of GnRH (50ug) on the ovulation rate and the time of ovulation following the implementation of modified OvSynch® (MOVS) protocol and whether there is a breed difference in response. Fifteen JE and seventeen HO cows were used. Fifty-five days postpartum (d #14) cows received (i.m.) 25mg PGF2α. Fourteen days later (d 0) all cows were treated with MOVS as follow: GnRH (50ug)–7d→PGF2α (d7)–2d→GnRH (50ug;d 9). Ovarian activity was monitored by ultrasound on d 0, 7, and 9 and 16. To determine ovulation time ultrasonogrpahy were conducted at 12 h, 20 h and then every 3 h until 39 h after second GnRH. Blood samples

were collected on d 7 and 9 for serum progesterone (P4). Mean BW was different (P < 0.01) for JE and HO (435 ± 14 vs 610 ± 13 kg, respectively). On day 7, all cows had a CL and mean P4 was 3.7 ± 2.7 ng/mL and did not differ by breed. On d 9, P4 concentration decreased to 0.13 ± 0.03 ng/mL and was similar for JE and HO. Mean diameter of the ovulatory follicles were 16.1 ± 4.19 for JE and 18.6 3.18 mm for HO, (P > 0.2). Rate of ovulation did not differ between the breeds and was 93% for JE and 94% for HO. Mean ovulation time relative to second GnRH did not differ between the two breeds (26.5 ± 4.2 h JE vs. 25.9 ± 5.0 h HO). No cow exhibited estrus. Cows that ovulated developed a CL by d 16 (7 d after ovulation). These results indicated that although HO, on dose per kg BW basis, received a lower dose of GnRH the reduced dose of GnRH did not affect ovulation time relative to the second GnRH and did not compromise ovulation rate and luteal development. Therefore, 50ug GnRH is as effective in synchronizing ovulation in a MOVS protocol.

Key Words: Timed AI, GnRH dose, Ovulation

1227 Dairy MAP: udder health module for evaluating dairy herd management. L. O. Ely*[1], W.D. Gilson[1], J. W. Smith[1], A. M. Chapa[2], and S. Chandrasekaran[1], [1]*University of Georgia, Athens, GA* , [2]*Mississippi State University, Mississippi State, MS*.

DHI records provide a wealth of information for monitoring and managing the dairy herd. A computerized system has been developed to assist producers in analyzing data from their herd. The program also provides specific recommendations based on the DHI information and additional information provided by the producer to an expert system. A module has been included to assist producers and their advisors in monitoring the udder health management program for a herd. The first phase of the program compares information from the producer's herd summary report with similar herds. The first benchmark table provides a comparison with herds of similar size and within the same region for the herd's SCC, weighted SCC, percent scores 0-3 and percent scores 7-9. The second table compares the herd's cell count information with herds of various levels of milk production. The user may continue with more detailed benchmarking by answering additional questions. The detailed benchmarks compare specific groups of cows with their counterparts in similar herds. The detailed tables provide an analysis of cell count by lactation group (first, second, third+) and stage of lactation. The data analyzed includes herd SCCS, percent 0-3 and percent 7-9. The output presents the deviations from expected values as a series of asterisks ranging from 1=poor to 6=excellent to assist in identifying areas for improvement. The second phase of the program consists of an expert system, which requests additional information before providing recommendations. The information requested includes culture results, milking practices, housing and therapy. Questions are grouped to include specific areas of management such as dry cow management, freestall management and milking procedures. The questions are further customized to account for variations in facilities and management styles. Recommendations are generated based on the information derived from the herd summary report and the answers given to the questions. The questions and recommendations were developed by a group of dairy scientists and veterinarians. The program is not designed to supplant the need for technical assistance but to augment existing programs and focus attention on management areas needing attention.

Key Words: Udder health, Expert system, Mastitis

1228 Incorporating estradiol cypionate (ECP®) into the OvSynch® (OVS) protocol to improve conception rates in dairy cattle. C. B. Sellars*[1], A. Ahmadzadeh[1], R. Manzo[1], J. C. Dalton[2], and J. Day[3], [1]*University of Idaho, Moscow, ID,* [2]*Southwest R & E Center, University of Idaho, Caldwell, ID,* [3]*Dairy Health Services, Jerome, ID*.

There is evidence that induction of ovulation by GnRH during proestrus, as occurs in OVS [GnRH–7d→PGF2α–2d→GnRH→Timed AI], may impair ovarian estradiol secretion and shorten the subsequent luteal phase in cattle. It was hypothesized that administration of a small dose of ECP at the time of the second GnRH injection would effectively synchronize ovulation and increase conception rate. The objectives were to determine the effect of ECP incorporation into OVS on ovulation time, ovulation rate, luteal development, and conception rate in dairy cows. In Exp 1, twenty-three lactating Holstein cows (∼58 DIM) were synchronized with 25mg PGF2α (d -10). Ten days later 100mg GnRH was given (d 0) followed by 25mg PGF2α on d 7. On d 9 cows were assigned randomly to receive either GnRH + 0.25mg ECP (OVS-ECP; n=11) or GnRH + placebo (OVS; n=12). Ovarian activity was recorded once daily with ultrasound on d 0, 7, and 9. To determine ovulation time, ultrasound examinations were conducted at 12 h, 20 h, and then every 3 h until 35 h after treatment or until ovulation. Presence of a CL was determined on d 16. Blood samples were collected on d 0, 7, 9, 10, and 16 for serum progesterone (P4). Serum P4 concentration did not differ between groups at any time. Cows that ovulated exhibited CL on d 16. Ovulation rate did not differ between groups (100% OVS-ECP vs. 92% OVS). Mean ovulation time relative to last injection was similar between groups (26.3 ± 0.5 OVS-ECP vs. 27.3 ± 0.5 h OVS). In Exp 2, 282 lactating cows on three farms were assigned randomly to either OVS-ECP (n=143) or OVS (n=139) as described in Exp 1. Cows received AI 12-24 h post treatment. Conception rates were not different between groups (29.4% OVS-ECP vs. 35.3% OVS). Incorporation of ECP into the OvSynch protocol did not change ovulation time, ovulation rate, or luteal development, and no improvement in conception rate was observed.

Key Words: Timed AI, Estradiol cypionate, Conception rate

1229 Evaluation of dried whole egg and egg components in calf milk replacers. D. R. Catherman*, *Strauss Feeds, Watertown, WI*.

One hundred twenty Holstein heifer calves (average 36.7 kg BW) were used to evaluate the effects of addition of dried egg or egg components to milk replacer (MR) on health and performance. Calves were allotted by weight to one of five treatment groups. Milk replacers were formulated at 20% crude protein and 20% fat and contained the following: treatment 1, all milk protein control; treatment 2, 15% inedible whole egg; treatment 3, 9% edible egg albumin; treatment 4, 6% edible egg yolk; and treatment 5, 9% edible egg albumin and 6% edible egg yolk. Milk replacer was fed at 454 g/d in 3.8 l of water. Calves were weaned at 35 d with feed intake recorded for 42 d. Calves were weighed at 0, 21 and 42 d. Water and starter grain (18% crude protein) were offered free choice from d 3. Total MR intake was 13.8 kg for each treatment. Starter intake was higher (P<.05) for treatment 4 (29.2 kg) than for treatments 2 (21.9 kg) and 3 (23.3 kg). Intakes for calves in treatments 1 (27.4 kg) and 5 (23.4 kg) were not different from the other treatments. Weight gains between d 0 and d 21 were greater (P<.05) in treatments 1 (8.1 kg) and 4 (8.4 kg) than in treatments 2 (5.4 kg) and 3 (5.2 kg), with treatment 5 (6.0 kg) being similar to all. Overall weight gains (d 0 to 42) were higher (P<.05) for treatments 1 (19.5 kg) and 4 (19.6 kg) than for treatments 2 (12.0 kg), 3 (11.5 kg) and 5 (13.8 kg). Feed cost per kg of gain was lower (P<.05) for treatments 1 ($1.63) and 4 ($1.67) than for treatments 2 ($2.27), 3 ($2.62) and 5 ($2.24). Scour scores were not different. Medicaion costs per calf were $13.65, $16.67, $18.06, $14.24 and $19.22 for treatments 1 through 5, respectively. These data indicate that incorporation of whole egg into calf milk replacer results in a significant reduction in performance and an increase in cost per kg of gain. This response appears to be associated with the albumin fraction of the egg. Egg yolk seems to be an acceptable ingredient for use in calf milk replacers.

Key Words: calves, milk replacer, egg

1230 Contacts between milking cow husbandry and vertical co-operation. Huda F. Salem, Sandor J. Dr. Zsarnoczai*, Laszlo Dr. Villanyi, and Endre Dr.(DSc)Szucs, *Szent Istvan University, Godollo, Hungary*.

"The study analyses contacts of producers on milking cow husbandry farms with dairy processors based on vertical co-operation in Hungary. The analysis emphases bargain position of milk producers and their favourable and unfavourable conditions concerning to processors. Within vertical co-ordination 90 % of purchased milk were bought by milk collecting units and from them to processors based on purchasing and sale contracts. Purchasing price of raw milk is free price, which depends on characteristics of milk. 76 % of purchased milk was of extra quality in 1998. By the end of 1990s 40 % of cows was in co-operatives, 27 % was in companies and 33 % was on family farms. Farms owning average more than 200 cows provided 78,6 % of milk production. The milk production is concentrated. The share of milk producer-ownership in

milk processing, namely the co-operatives, small and medium scale farms owned 5,4 % of subscribed capital of milk processing. Ownership-part and favourable bargain position can be strengthened by co-operative contacts between producers. Housing and management system applied in Hungary meets the directives of EU in term of management policy: feeding, milking system, manure disposal and treatment, cows have individual place demand is for rest, feeder and moving, computer controlling system for farms, production technology and animal health condition control."

Key Words: Milking cow husbandry, Bargain position, Computer controlling system

1231 Vertical co-ordination in the Hungarian milk production. H. F. Salem, L. Villanyi, I. Feher, and J.S. Zsarnoczai*, *Szent Istvan University, Godollo, Hungary.*

The study compares and analyses several main Hungarian and EU experiences of vertical co-ordination and vertical integration in milk production based on EU qualitative demands. Compare data based on economic role and bargain position of participants of product-way before transition and during transition. Before the transition share of agricultural co-operatives was 55 % of milk production, 15 % of dairy processing, 25 % of retail trade 25 %, share of state-farms was 20 %, 85 %, and 60 % as mentioned branches. Dairy family farms provided 25 % of milk production, hotels-restaurants provided 10 % of retail trade. By the end of 1990s share of co-operatives was 40 % of production, 15 % of processing, 20 % of retail trade, private companies provided 32 %, family farms provided 25 % of milk production. Processing companies provided 85 % of dairy processing. Large chain stores' share was 35 %, independent retailers' share was 25 %, hotels-restaurants' share was 10 %, whole traders' share was 10 % of retail trade. In EU milk producers control 70 % of milk-selling within co-operative, in Hungary it was less than 5 % of processing. Processing has concentrated in Hungary, first largest four processing companies provided 38 % in 1998 and 53 % of processed milk in 1999. In 1998 the records of the National Tax Authority showed 100 milk processing companies, of which only 85 were active. Favourable trends were also reflected in investments. More than 5 billion HUF in 1998 and 6,6 billion HUF in 1999 were invested in the milk sector, of which 69-74 % was for machinery and equipment and 26-31 % was for constructions. Vertical co-ordination makes easier to keep EU qualitative demands, and bargain position of processors became stronger than producers, but large chain stores' one became stronger than processors' one. Type of vertical co-ordination inside a company is vertical integration, which can be base on co-operative model, as in EU.

Key Words: Vertical co-ordination, Agricultural co-operatives, Retail trade

1232 Withdrawn. , .

1233 Lactose concentration in milk from Quebec dairy cattle. D.M. Lefebvre*[1], R.K. Moore[1], and R.I. Cue[2], [1]*PATLQ-Quebec Dairy Herd Analysis Service,* [2]*McGill University, Ste-Anne-de-Bellevue, QC, Canada.*

Lactose is quantitatively the most important constituent of milk. As such it makes an important contribution to the energy value of milk. Its concentration in milk is generally assumed to be relatively constant. However, little is reported in the literature about the factors affecting it. Between June and December 2001, lactose was analyzed by infrared spectroscopy together with fat, total protein, lactose, urea N and somatic cells on 341278 samples submitted for analysis for milk recording (MR). Lactose percentage was lowest for the Ayrshire breed (4.48±0.30, n=15091), values for other breeds were: Holstein (4.56±25, n=322538), Brown Swiss (4.57±0.25, n=2183), Jersey (4.56±0.24, n=1232), Canadienne (4.61±0.28, n=234). Other descriptive statistics are presented for the Holstein breed. Lactose concentration was higher in primiparous cows (4.69±0.19) and declined with parity number (parity 2: 4.55±0.22, parity 3 and greater: 4.47±0.27). Stage of lactation was examined in blocks of 30 days. Lactose percentage was highest (4.68±0.19) in the second period (30-59 DIM), with the average concentration declining and variability increasing as DIM increased (for DIM 270-300, 4.49±0.28). Values were slightly higher in the summer (4.58±0.24) than in the fall (4.55±0.26). Concentration of lactose was lower and more variable (4.37±0.43) in samples associated with test day yields rejected as abnormal by MR than for than for normal test yields (4.57±0.24). Lactose was positively correlated with milk yield (.30) but negatively with concentration of fat (-.12) and protein (-.19) and with SCS (-.40). In the 2001 edition of the NRC Nutrient Requirements of Dairy Cattle, lactose can be included in the estimation of the NEL value of milk. The default value suggested when lactose concentration is unavailable is 4.85%. Using this default value rather than the actual analysis results in a slight overestimation of the energy value of milk (0.733 vs. 0.721 Mcal/kg for average composition of Holsteins).

Key Words: Milk, Lactose, Dairy cattle

1234 Determining the relationships among milk urea nitrogen and milk production, milk protein, milk fat and somatic cells counts from lactating cows in Texas. G. M. Goodall*[1], M. A. Tomaszewski[1], E. M. Sudweeks[1], J. W. Stuth[1], L. W. Green[2], and R. B. Schwart[1], [1]*Texas A&M University,* [2]*Texas A&M University and Extension Research Center.*

The objective of this study was to determine the relationship among MUN, milk production, somatic cell counts and milk components. The potential impact of elevated MUN levels on milk production, somatic cell counts and milk components directly affects the mailbox milk check. Overfeeding rumen degradable protein (RDP) can upset normal rumen function and potentially result in changes in milk production, its components and MUN levels. Excess nitrogen from the RDP can result in elevated environmental nitrogen. During this 3-year study, 18092 cow production and reproduction records were accumulated with their respective MUN levels. The cows were from Central and East Texas dairies where either a Total Mixed Ration or a grazing feeding system was being utilized. There were Jersey and Holstein cows in the study. MUN levels were significantly affected by date of test, parturition date, days in milk (DIM), and breed. The average MUN levels for the Holstein and Jersey grazing feeding systems were 16.89 mg% and 14.14 mg%, respectively. The average MUN levels for the TMR feeding system was 15.26 mg%. The 18.6 mg% peak MUN level occurred at 81 DIM. Milk production was significantly higher (P>. 001) in TMR feeding system, 33.27 kg, than the grazing feeding system, 19.68 kg. MUN significantly was affected by milk production levels in the grazing herds (P>. 0001). Milk protein and parity significantly affected MUN (P>. 0001). The overfeeding of RDP in the grazing feeding system typically occurred with the grazing of high quality lush winter pasture and resulted in higher MUN levels compared to lower quality summer pastures. Pasture quality was in excess of 25% protein. This would indicate the need to carefully monitor commodities and other feed inputs to reduce MUN levels without significantly affecting milk production.

Key Words: Dairy-cows, environmental nitrogen, grazing, Monitoring #milk, feeds and MUN

1235 Incidence of metabolic and reproductive conditions and mastitis in Holsteins and impact on performance during the first 100 days of lactation. R. K. McGuffey*[1], R. R. Hozak[1], J. I. D. Wilkinson[1], and H. B. Green[1], [1]*Elanco Animal Health.*

Production and health incidents were monitored in control multiparous (M=152) and primiparous (P=84) Holstein cows from a study at 9 locations in the United States (n=6) and Canada (n=3). Health incidents categorized as RE (dystocia, retained placenta, and metritis), ME (ketosis, displaced abomasum, and milk fever) and mastitis (MA) were monitored for 100 days of lactation (DIM). Twenty-one (M=12; P=9) cows failed to reach 100 DIM for various health reasons. Of the 215 survivors, milk (kg/d) DMI (kg/d) and body weight (BW) loss (kg) for those that experienced no health problems during the first 100 DIM averaged 39.9, 22.0 and #31.1 for M (n=61) and 30.2, 17.8 and #5.5 for P (n=34). Numbers of cows affected by disease category were: ME: M=28, P=17; MA: M= 52, P=25; and RE: M=26, P=11. Effects of parity, the three categories of health incidents and all interactions were examined for milk, DMI and BW loss during 100 DIM. Significance was declared at (P< 0.05). ME was associated with reduced DMI (19.0 versus 17.1) and greater BW loss (-22.9 versus #46.5). ME was also associated with reduced milk for M cows (P<0.02) but not for P cows (P>0.7). Milk for M cows averaged 38.0 and 34.9 without and with ME, respectively.

Milk for P cows averaged 27.5 and 28.1 without and with ME, respectively. MA and RE had no effect on milk, DMI and BW loss. Metabolic diseases can have significant impact on productivity of dairy cows.

Key Words: Metabolic Disease, Early Lactation, Performance

1236 The impact of tunnel ventilation on heat stress in lactating dairy cows: Effects on intake, milk production and composition. T. R. Smith*[1], S. Willard[1], A. Chapa[1], R. J. Williams[1], T. Riley[2], and D. Pogue[2], [1]*Mississippi State University, Starkville,* [2]*North Mississippi Branch Experiment Station, Holly Springs*.

In lactating dairy cows, the response to heat stress includes a decrease in feed intake, milk production and reproductive efficiency and an increase in the incidence of mastitis. To evaluate the potential for tunnel ventilation to alleviate the symptoms of heat stress in dairy cows, two groups of 10 lactating Holsteins were housed in a 20-cow freestall barn equipped with tunnel ventilation cooling and two similar groups were housed in adjacent freestall barns cooled with sprinklers and fans. Cows were randomly assigned to groups which were balanced for production, parity, and DIM. The 10-week study began June 25, 2001 and during the study, daily minimum and maximum ambient temperatures averaged 20.7 $\pm$ 2.2°C and 32.4 $\pm$ 1.9°C, respectively. Within the tunnel barn, wind speed averaged 6.9 $\pm$ 1.2 km/h and the maximum daytime temperature in the tunnel barn averaged 5.4 $\pm$ 1.3°C below that in the outdoor freestall barns. Exposure time to conditions of moderate heat stress (80-90 THI) was reduced from an average of 342 min/day outside to 55 min/day inside the tunnel barn. Rectal temperatures and respiration rates were collected three times weekly between 1400 and 1600. For cows housed in the tunnel barn, rectal temperatures averaged 0.34 $\pm$ 0.02°C lower ($P<0.0001$) and respiration rates averaged 10.6 $\pm$ 0.92 breaths/min lower ($P<0.0001$) than for cows housed outside. Intake of the silage-grain mix was 2.1 kg/cow/d greater ($P<0.0001$) for cows housed in the tunnel barn than for outside cows. Milk production for cows housed in the tunnel barn averaged 1.88 kg/cow/d greater ($P<0.0001$) than for cows housed outside, however there were no differences in milk composition between treatments. These results suggest that tunnel ventilation cooling has the potential to decrease the exposure to and alleviate the symptoms of heat stress in lactating dairy cows under the environmental conditions found in the southeastern U.S.

Key Words: Lactation, Heat Stress, Tunnel Ventilation

1237 Characteristics of expansion in the Utah-Idaho dairy industry. J. W. MacAdam*, D. Jackson-Smith, C. Groseclose, and R. Krannich, *Utah State University*.

Rapid expansion has occurred in the last decade within the dairy industry in the Intermountain West. However, patterns of dairy structural change appear to be quite diverse within the region. For this study, two geographic areas with long histories of dairy production were compared: a three-county area including Twin Falls in south-central Idaho (TF), where there has been a boom in the construction of very large (up to 10,000-cow) dairies, and an area including two contiguous counties on the northern Utah-southeast Idaho border (U/I), where small dairies are more reliant on family labor and residential development competes for agricultural land. Data were collected by mail survey from 101 TF farms and 144 U/I farms; response rates were 56% and 62%. Descriptive results confirm that the two study areas have very different dairy production systems. Dairy farms in both regions raised similar amounts of corn, grains, and soybeans (mean = 55 ha), TF farms had more cows per farm (mean = 771 cows) and less land in hay and pasture and thus much higher levels of animal/land intensity than the U/I farms (mean = 145 cows). Nearly one-third of TF farms reported they raised no feed. These differences are also reflected in the technology and management practices used on farms in each region. TF farms were more likely to have larger parlors and higher use rates of TMR machinery, computers, rBST, and expanded ration analysis. TF farms relied heavily on hired labor. Data on recent expansions suggest there has been widespread growth in herd size in both study areas. However, the rate of expansion (as well as the absolute size of herd growth) was higher for TF. Fewer U/I farms have recently expanded, were less likely to be planning a significant herd expansion, and were more likely to plan to exit or sell land to a developer in the next 5 years. In both areas, modest, incremental herd growth was the most common pattern, while most new cows came in through fewer dramatic expansions. Despite these differences, the vast majority of dairy farms in both regions expect to remain in business for at least another 5 years.

Key Words: Dairy farms, Expansion, Demographics

1238 The effect of the amount of sawdust on geotextile mattresses on free stall preference and usage. Cassandra Tucker* and Daniel Weary, *University of British Columbia , Vancouver BC Canada*.

Geotextile mattresses have gained popularity in recent years. Although mattresses are thought to provide financial benefits to producers, there are concerns that bare mattresses not compatible with cow comfort. Eleven dry, multiparous cows were housed individually in pens with access to three free stalls. Each stall was fitted with a geotextile mattress covered with either 0, 1 or 7.5 kg of kiln-dried sawdust. The animals were restricted to each stall in turn, in a random order, for 3 days. Behavioral data was collected during the last 2 days of restriction to each stall using time-lapse video recording. During the restriction phase, time spent lying and the number of lying events increased with the amount of sawdust and were lowest on bare mattresses (11.6 h and 7.8 per 24h, respectively) and highest in stalls with 7.5 kg of sawdust (13.8 h and 10.4 per 24h, respectively) (ANOVA, $P < 0.05$). After the restriction phase, the animals were allowed access to all three stalls for three days. During the last two days of this phase, the animals were video taped and preference for amount of bedding, based on lying times, was determined. All eleven animals spent at least 85 % of their lying time in the stall bedded with 7.5 kg of sawdust and clearly preferred this treatment to mattresses covered w

Key Words: Free-stall design, Cow comfort, Preference testing

1239 The effects of strategic cooling on thermal balance of late gestation dairy cows. E Oetting, J Spain, and J Sampson*, *University of Missouri-Columbia/USA*.

This study measured the effects of cooling on thermal balance of and production by dairy cows. Twenty-four primiparous (n = 21 Holstein, 3 Guernsey) and twenty multiparous cows (n = 19 Holsteins, 1 Guernsey) were paired on the basis of parity, breed, and expected calving date and assigned to one of two groups. The control group received no supplemental cooling. The treatment group was sprayed with water and exposed to fan cooling for one hour at 0700 h and 1900 h three times per week. Pre-cooling (0600 h and 1800 h) and post-cooling (0800h and 2000h) measurements were recorded for both groups. Thermal balance measurements include skin (shoulder, rump, and tail head) and rectal temperatures and respiration rates. After calving, both groups were housed in the same freestall facility with 24-h fan cooling. Blood samples were collected at d 14 and d 7 prepartum, day of calving (DOC), and at d 3, d 7, and d 14 postpartum. Plasma non-esterified fatty acids (NEFA), ketones, glucose, and urea-nitrogen were quantified. Pre-cooling rectal temperatures were similar for both groups. Prior to cooling, respiration rates of cooled cows were higher than control cows in the morning and evening. Cooling reduced respiration rates from 58.4 to 51.5 bpm (a.m.) and from 66.2 to 53.7 (p.m.). Prepartum ketone levels were higher for cooled animals than for control animals (7.26, 11.34, 13.28 mg/dL vs. 2.01, 2.97, 7.71 mg/dL). On DOC, cooled animals had lower NEFA levels than control animals (0.35 versus 0.42 mEq/L). Postpartum NEFAs were higher for cooled animals than control animals. Ketone levels from DOC to d 7 declined for cooled animals (12.41, 10.09mg/dL), and increased for control animals (7.31, 11.88mg/dL). From d 7 to d 14, ketones of cooled animals increased to a similar concentration as that at d 3 postpartum (12.90 mg/dL), while ketones of control animals declined to a level below the d 3 postpartum level (6.22 mg/dL). Average daily milk yield was 1.5 kg higher for cooled animals than for control animals. These results indicate that prepartum cooling improved energy balance during heat stress. Cooling prepartum animals increased postpartum milk production by decreasing the prepartum negative energy balance in late gestation, heat-stressed animals.

Key Words: Strategic cooling, Late Gestation Dairy Cows, Heat stress

1240 Use of management practices to define Friesian and Brown Swiss herd environments in Southeastern Sicily. E. Raffrenato*[1,2], R. W. Blake[2], and P. A. Oltenacu[2], [1]*Consorzio Ricerca Filiera Lattiero-Casearia, Ragusa, Italy,* [2]*Cornell University, Ithaca, NY.*

A 2000 survey of 250 herds (175 Friesian and 75 Brown Swiss; 84% of the total enrolled in the dairy recording program) was conducted using a questionnaire describing practices of milking, nutrition, housing, health, and reproduction. Subsets of 24 and 17 practices were utilized to differentiate high and low opportunity environments. A dissimilarity coefficient, the distance of Jaccard, was created among all farms. An asymmetric binary variable was assigned to each practice to describe its presence or absence in each herd. A distance matrix described the separations among all farm pairings, and farms were clustered in two groups using the Lance-Williams flexible-beta method. This resulted in 95 and 73 Friesian herds and 27 and 44 Brown Swiss herds allocated to low and high opportunity environments. High opportunity herds outperformed the low ones for all yield traits. Average ME yields of milk, fat and protein were 8544, 290 and 257 kg/cow and 9851, 329 and 300 kg/cow for low and high opportunity Friesian herds; and 6120, 228, and 203 kg/cow and 7064, 259 and 240 kg/cow for Brown Swiss herds. These results showed good separation in actual herd performance using *a priori* management information.

Key Words: management practices, herd environment, milk production

1241 Impact of regrouping on feeding behaviour of early lactation cows. L.G. Baird*[1], M.A.G. von Keyserlingk[1], D.M. Weary[1], J.A. Shelford[1], and K.A. Beauchemin[2], [1]*The University of British Columbia, Vancouver, Canada,* [2]*Agriculture and Agri-Food Canada, Lethbridge Research Centre, Canada.*

Regrouping cows is a regular management practice that occurs at different stages of lactation and is thought to influence feeding behaviourand subsequent productivity. These concerns are of particular importantance during the transition period, when animals are faced with an increased risk of metabolic disorders and loss of body condition, in additon to the challenges of a new social group. These problems are intensified for primiparous cows that have increased energy demands due to growth and lactation. These animals are also believed to be less dominant when mixed with older multiparous cows and therefore may have greater difficulty accessing the feed bunk at prime feeding times. In this study, 11 primiparous and 12 multiparous early lactation cows were housed in two adjacent pens. All animals were fitted with transponders that allowed for computerized monitoring of the location and duration of each visit to the feed bunk. Individual feeding behaviour and social status were monitored for four days prior to mixing. The effects of mixing were assessed by switching two animals from each pen into the adjacent pen for 4 days. Cows were then returned to their original pen and monitored for an additional four days. No significant differences ($P > 0.05$) in feeding frequency or duration were found when cows were mixed into the unfamiliar group. Over the course of the experiment, feeding frequency (visits to the feed bunk) and daily feeding duration (total time spent at the feed bunk) averaged (mean $\pm$ S.D.) 7.75 $\pm$ 1.59 meals and 333.60 $\pm$ 65.01 min per 24h, respectively. Social order within the group had no effect on feeding frequency or duration when cows were regrouped. These data indicate that mixing cows into an unfamiliar group has little or no effect on feeding behaviour.

Key Words: feeding behaviour, early lactation, social order

1242 A systems on farm comparison between confinement and management intensive grazing for dairy heifers. M. Rudstrom[1], H. Chester-Jones[2], R. Imdieke[3], D.G. Johnson*[1], A. Singh[1], G. Cuomo[1], and M. Reese[1], [1]*University of Minnesota, WCROC,* [2]*SROC,* [3]*Dairy Progeny Management.*

Two groups of 72 Holstein heifers (av initial BW, 218 kg) were used in a 145-d study to evaluate the economics of integrating a grazing enterprise versus a traditional open-front confinement feedlot with corn, soybeans and alfalfa crop rotations on a commercial Minnesota livestock and crop farm. Replicated groups of 36 heifers were assigned to either the feedlot (FDLOT) or pasture (MIG). MIG heifers were transitioned from a feedlot total mixed ration (TMR) over a 10-d period. MIG heifers were grazed over 11.3 hectares (ha) of established alfalfa pasture (6.4 heifers/ha) and supplemented daily with .45 to 1 kg of cracked corn containing an ionophore and hay, the amount varying with pasture availability. Heifers on both systems performed similarly ($P > .05$), av .92 kg/d gain. Total feed, labor, machinery use, and equipment costs were documented over the 145-d trial. Two MIG heifers died during the trial.

Feedlot and pasture cost comparisons

	Feedlot		Pasture	
	Total Cost	$/hd/day	Total cost	$/hd/day
Feed Cost	$7,636.15	$0.73	$2,804.96	$0.28
Labor	$2,675.25	$0.26	$815.63	$0.08
Machinery	$3,429.61	$0.33	$1,296.09	$0.13
Health Costs	$360.00	$0.03	$432.00	$0.04
Facilities	$1,000.00	$0.10		
Bedding	$730.80	$0.07		
Fencing, bunks, water			$810.53	$0.08
Pasture charge			$19,12.50	$0.19
Death Loss			$1,550.00	$0.15
Total cost	$15,831.01	$1.52	$9621.71	$0.95
Manure credit	$359.52	$0.03		
Net cost	$15,471.49	$1.49		

Key Words: Dairy replacement management, Confinement vs. grazing, Replacement economics

1243 Factors affecting conception rate and pregnancy loss in actating holstein cows. R. Chebel*[1], J. Santos[1], J. Reynolds[1], M. Overton[1], R. Cerri[1], and S. Juchem[1], [1]*University of California Davis.*

In study 1, conception rate (CR) was evaluated in a commercial dairy farm in which 7,384 lactating cows were examined for pregnancy by rectal palpation 393 d after AI. Ambient temperature was recorded for the following periods: day -50 to AI, and from AI to pregnancy diagnosis. In study 2, 1,503 Holstein cows on three commercial dairy farms were examined by ultrasonography on day 303 d after AI and pregnancy was reconfirmed 14 d later by rectal palpation. Ambient temperature was also recorded for the periods described above. Parity, DIM at AI, milk production, and AI protocol (timed AI vs estrus detection) were recorded for each individual cow. Heat stress (HS; $T > 29$ C) prior to or after AI was categorized based on the mean daily average maximum temperature (MDAMT) for each period. Exposure to HS was defined as following: daily maximum temperature < 29 C (NHS) and no single daily maximum temperature > 29 C; exposure to at least one day of maximum temperature > 29 C and MDAMT < 29 C (HS1); and exposure to MDAMT > 29 C (HS2). In study 1, CR was decreased by HS prior to AI (32.3 vs 24.7; $P<0.001$). Cows not exposed to HS prior to AI had higher CR compared to HS1 and HS2 (32.3 vs 29.0 vs 23.5; $P <0.01$). Post-insemination HS exposure did not affect CR ($P<0.27$). Mean maximum temperature for HS and no HS periods were 33.6 and 22.9 C ($P<0.001$). Neither parity (23.7 vs 27.4% for multiparous and primiparous; $P<0.24$) nor insemination protocol (25.6 vs 24.3% for estrus detection and timed AI; $P<0.33$) affected CR. Cows with production below the mean milk yield achieved higher CR than those with production above the mean (26.5 vs 23.9%; $P<0.02$). In study 2, pregnancy loss was not influenced by HS prior to AI ($P>0.15$), but cows not exposed to HS had lower pregnancy loss than HS2 (9.6 vs 14.0%; $P<0.07$). When DIM at pregnancy diagnosis were divided into quartiles, cows with advanced lactation experienced higher pregnancy losses (10.4 vs 11.4 vs 14.5 vs 16.4%; $P<0.01$). Neither parity no AI protocol had any effect on losses of pregnancy ($P>0.15$). Exposure to HS prior to AI reduces CR, and exposure after AI increases pregnancy losses in lactating dairy cows.

Key Words: Conception rate, Pregnancy loss, Heat stress

1244 A non-linear approach to modeling methane emissions from dairy cows. J. A. N. Mills*, E. Kebreab, L. A. Crompton, C. M. Yates, and J. France, *The University of Reading.*

Conventional linear models of methanogenesis have suffered from an inability to give reliable predictions outside the range of intake used in their formulation. It is well established that as intake increases, the percentage of GE lost as methane declines. This implies that any model of methane production based on DMI, GEI or MEI should be non-linear.

The objective of this research was to compare linear regression methods with non-linear techniques and to develop a model with universal application across the full range of intake. Data from 11 trials (n = 159) conducted at the Centre for Dairy Research (CEDAR) UK, were used to develop the models. The backward elimination procedure for multiple regression in SAS was used to produce the linear models and the criteria for selecting the best-fit model were as described by Oldick et al. (1999). The main effects were analysed using Proc Mixed procedure of SAS (2000). The best fit model was as follows: CH_4 (MJ/d) = 5.93(SE 1.60) + 0.92(SE 0.08) × DMI (kg/d) (r^2=0.60; RMSE = 1.82). The Mitscherlich model was also chosen to represent methane production and parameterized according to the CEDAR data as follows: CH_4 (MJ/d) = CH_4max # (CH_4max + CH_4min)$e^{(-axMEI)}$ (r^2 = 0.66; RMSE =1.8). Where CH_4max (MJ/d) = 39.9, a = 0.0039 and CH_4min (MJ/d) = 0 The Mitscherlich model was evaluated alongside the linear model using an independent dataset comprising trials conducted at the Agricultural Research Institute of Northern Ireland (ARINI) (n = 62) and the Grassland Research Institute, Hurley, UK (n = 44). These data were from Holstein cows fed typical grass or grass silage based diets. The Mitscherlich model improved methane prediction in comparison to the linear model (r^2 = 0.81 vs 0.78). The root mean square prediction error as a % of the observed mean (rootMSPE%) was lowest for the Mitscherlich model (12.2 vs 14.9) and this was combined with the lowest proportion of MSPE due to bias (0.10 vs 0.24) and regression (0.10 vs 0.14). In contrast to linear models, the Mitscherlich model was able to predict methane over the full range of intake whilst applying parameters with a biological basis.

Key Words: Methane, Dairy cow, Modeling

1245 Physiological variations of milk components in relation to seasonal changes over two years. F. Brulisauer[1], J. Moll[2], and R. Eicher*[3], [1]*Swiss Federal Veterinary Office, Berne, Switzerland,* [2]*Swiss Braunvieh Cattle Association, Zug Switzerland,* [3]*Univerity of Berne, Switzerland.*

Nutritional and metabolic imbalances can be diagnosed by analysing milk components (fat, protein, urea) on a herd base. However, physiologic changes and non-nutritional factors have to be taken into account for a precise evaluation. The goals of this study were to investigate physiological variation of milk components according to non-nutritional factors like individual and herd level of production, somatic cells counts, climate zone, and seasonal effects. Study data included more than 33'000 lactations of Swiss Braunvieh cows from totally 1000 farms. Samples were taken monthly over 2 years, divided in 2 time periods each (green forages/pasture vs. conserved forages). The dairy farms were randomly chosen from 3 different land registers based mainly on altitude (500 farms in the valley zone, 250 farms in the mountain 1 zone, and 250 farms in the mountain 2-4 zones). Data analysis was mainly descriptive: median and interquartile range were calculated for the different levels. Special focus was set on seasonal variations. Results did not differ a lot between corresponding periods of the 2 years, although statistics of forage analyses were quite better in the second year. This can be mainly explained by a higher volume of sales of concentrates in the first winter. In valley zone the percentage for milk fat stayed relatively constant during summer (3.8-4.1%), during winter feeding there was a tendency of decrease, but on a higher level (4.4-3.9%). Fat values tended to be lower in mountain zones 2-4 (3.8-4.1%) in winter. Herds with high annual milk yield generated similar, in winter even slightly higher percentages of milk fat than herds with lower milk yields. Milk protein increased in the end of summer and decreased during winter. Valley farms had higher protein than mountain farms. Herds with high annual milk yield generated equal or higher protein values. Milk urea increased markedly during summer and was relatively stable in winter. Urea level in summer milk didn't vary in the different yield categories. In winter high yield cows produced higher urea values than cows with low yields.

Ruminant Nutrition
Fat and Intake

1246 Partial replacement of corn grain by calcium salts of unsaturated fatty acids in grazing dairy cows : 1- Dry matter intake, milk production and composition. L.I. Vidaurreta[1], G.A. Gagliostro[2], G.F. Schroeder*[1−3], and G. Eyherarbide[2], [1]*Fac. Cs. Agrarias. UNMdP,* [2]*INTA EEA Balcarce,* [3]*CONICET, Argentina.*

The effect of replacing fermentable energy (corn grain) by calcium salts of unsaturated fatty acids (UFA-Ca) on DM intake, milk yield and milk composition was studied in grazing dairy cows in midlactation (116 DIM). Two groups of seven multiparous Holstein cows (588 62 kg BW) were assigned to one of two treatments in a cross-over design. The cows grazed a fresh winter oat pasture (DM= 20.5%, NDF= 33.3%, CP= 19.4%, IVDMD= 73.2%) with an herbage mass averaging 1535 kg/DM/ha. Treatments consisted in two isoenergetic concentrates composed by 7 kg/d of ground corn grain and 0.4 kg/d of fish meal (T0) or 4.8 kg/d of corn grain, 0.4 kg/d of fish meal and 0.9 kg/d of UFA-Ca (T1). Fat energy represented about 13% of total metabolizable energy requirement of the cows. Neither pasture, DMI nor energy total intake were affected by fat supplementation. Yields of milk and milk protein were increased by feeding UFA-Ca. Milk fat yield was not increased and milk fat concentration was reduced. Milk protein content tended to be lower when UFA-Ca were fed. Changes in BW and BCS did not differ between treatments. Concentrations of plasma NEFA, glucose, triacilglycerides, total cholesterol and urea were not affected. Replacing rumen fermentable energy by UFA-Ca slightly increased milk and milk protein yields but decreased milk fat content in midlactation dairy cows in grazing conditions.

	T0	T1	SEM	P≤
Intake (kg DM/d)				
Pasture intake	19.1	18.9	0.77	0.92
Total DMI	23.6	22.4	0.80	0.39
Milk yield, kg/d	20.4	21.7	0.18	0.01
Milk Fat				
kg/d	0.61	0.60	0.01	0.22
%	3.08	2.72	0.07	0.01
Milk Protein				
kg/d	0.70	0.74	0.01	0.01
%	3.52	3.45	0.02	0.06

Key Words: milk production, fat supplementation, grazing

1247 Partial replacement of corn grain by calcium salts of unsaturated fatty acids in grazing dairy cows: 2- Milk fatty acid composition. L.I. Vidaurreta[1], G.A. Gagliostro[2], G.F. Schroeder*[1−3], A. Rodriguez[4], and P. Gatti[4], [1]*Fac. Cs. Agrarias. UNMdP,* [2]*INTA EEA Balcarce,* [3]*CONICET,* [4]*INTI CITIL PTM, Argentina.*

The aim of the study was to determine the effect of partial replacement of corn grain by calcium salts of unsaturated fatty acids (UFA-Ca) on milk fatty acid composition in grazing dairy cows in midlactation (116 DIM). Fourteen multiparous Holstein cows (588 62 kg BW) were assigned to one of two treatments in a cross-over design. All cows grazed an oat (Avena sativa, L) pasture (DM= 20.5%, NDF= 33.3%; CP= 19.4%; IVDMD= 73.2%, availability = 1535 kg/DM/ha) and were supplemented with two isoenergetic concentrates composed by 7 kg/d of ground corn and 0.4 kg/d of fish meal (T0) or 4.8 kg/d of corn grain, 0.4 kg/d of fish meal and 0.9 kg/d of UFA-Ca (T1). Fatty acid composition of the UFA-Ca used was: C14:0 (1.6%), C16:0 (16%), C16:1 (1.6%), C18:0 (13.5%), C18:1 (32%), C18:2 (30%), C18:3 (0.8%) and C20:0 (0.3%). Milk concentration of long-chain FA resulted higher,