**Table 1. Standardized ileal digestibility (%) of AA**

| Diet | DDGS1 | DDGS2 | Hominy | Corn Gluten Meal | Corn Germ Meal | Corn Gluten Feed | Corn |
|---|---|---|---|---|---|---|---|
| Ile | 76.27$^{c}$ | 79.32$^{bc}$ | 87.13$^{a}$ | 85.60$^{a}$ | 77.11$^{c}$ | 64.27$^{d}$ | 80.93$^{b}$ |
| Lys | 46.10$^{c}$ | 65.39$^{b}$ | 79.55$^{a}$ | 76.39$^{a}$ | 61.01$^{b}$ | 28.59$^{d}$ | 67.12$^{b}$ |
| Met | 81.12$^{b}$ | 83.52$^{b}$ | 89.54$^{a}$ | 89.03$^{a}$ | 81.50$^{b}$ | 67.17$^{c}$ | 87.29$^{a}$ |
| Thr | 69.77$^{c}$ | 74.56$^{bc}$ | 79.90$^{ab}$ | 82.38$^{a}$ | 66.02$^{c}$ | 53.90$^{d}$ | 76.48$^{b}$ |
| Trp | 86.35$^{ab}$ | 86.42$^{ab}$ | 90.70$^{a}$ | 91.18$^{a}$ | 85.50$^{bc}$ | 58.31$^{d}$ | 80.68$^{c}$ |
| Val | 74.85$^{c}$ | 78.54$^{bc}$ | 86.03$^{a}$ | 84.18$^{a}$ | 75.66$^{bc}$ | 63.14$^{d}$ | 79.12$^{b}$ |

$^{a, b, c, d}$ Means lacking common superscript in same row are different ($P < 0.05$).

**Key Words:** corn co-products, pig, standardized ileal amino acid digestibility

**338 Net energy of distillers dried grains with solubles and high protein distillers dried grains fed to growing and finishing pigs.** N. A. Gutierres*, D. Y. Kil, and H. H. Stein, *University of Illinois, Urbana*.

An experiment was conducted to measure the NE in distillers dried grains with solubles (DDGS) and in high protein distillers dried grains (HP-DDG) fed to growing and finishing pigs. Conventional DDGS (DDGS-CV), uncooked DDGS (DDGS-BPX), and HP-DDG were used. A total of 52 growing (20 ± 2 kg BW) and 52 finishing pigs (87 ± 10 kg BW) were allotted within each stage of growth to 6 groups based on BW. At each stage of growth, there were 8 replicate pigs in 2 groups and 9 pigs in the remaining 4 groups. The 2 groups with 8 pigs at each stage of growth were used as the initial slaughter group and were harvested at the initiation of the experiment. Pigs in the remaining 4 groups at each stage of growth were housed individually and had free access to feed and water. Treatments included a basal diet containing corn and soybean meal and 3 diets that were formulated by mixing 70% of the basal diet and 30% DDGS-CV, DDGS-BPX, or HP-DDG. Experimental diets were fed to growing pigs for 28 d and to finishing pigs for 35 d. All pigs were harvested at the end of the experiment and blood, carcass, and viscera samples were analyzed for GE, CP, and ether extract. The NE for DDGS-CV, DDGS-BPX, and HP-DDG were calculated by subtracting the contribution from the basal diet to the NE of the treatment diets. In growing pigs, no differences were observed in energy retention and the NE of DDGS-BPX (1,596 kcal/kg), DDGS-CV (1,665 kcal/kg), and HP-DDG (1,783 kcal/kg) were not different. Finishing pigs fed the DDGS-CV diet had greater ($P < 0.05$) lipid gain than pigs fed any of the other diets. The NE of DDGS-CV (2,718 kcal/kg) was also greater ($P < 0.05$) than the NE of DDGS-BPX (2,065 kcal/kg) and HP-DDG (2,291 kcal/kg). The NE of DDGS-CV, DDGS-BPX, and HP-DDG were greater ($P < 0.05$) in finishing pigs than in growing pigs. In conclusion, the NE of DDGS and HP-DDG may vary according to the stage of growth, but the NE of corn-soybean meal diets containing 30% DDGS or HP-DDG, is not different from the NE of corn-soybean meal diets containing no DDGS or HP-DDG.

**Key Words:** distillers dried grains with solubles, high protein distillers dried grains, net energy

**339 Effect of saturated fat in diets with corn distillers dried grains with solubles (DDGS) on growth performance, carcass characteristics and apparent digestibility of nutrients of diets for finishing pigs.** L. S. Freitas*[1], M. J. Azain[2], D. C. Lopes[1], C. R. Dove[2], T. D. Pringle[2], P. Cline[2], and T. C. Tsai[2], [1]*Federal University of Viçosa, Vicosa, Brazil*, [2]*University of Georgia, Athens*.

The objective of this study was to determine if the negative effects of DDGS on carcass characteristics could be offset by the addition of saturated fat to the diet. The study was conducted as a 2 × 2 × 2 design with main effects of: DDGS (0 vs 30%), saturated fat (0 vs 4%) and gender (barrow vs gilt). The saturated fat was a dry, animal fat with 70% saturated fat content and an iodine value of 28. There were a total of 80 pigs (IW = 76 kg) randomly assigned to 16 pens (5 pigs/pen) within gender. Experimental diets were fed for 6 wk and the effects on performance, carcass characteristics and nutrient digestibility evaluated. Two pigs/pen were slaughtered to collect samples of leaf and belly fat, backfat and loin for fatty acid profile determination and carcass characteristics. There were no significant effects of the saturated fat addition in either the control or 30% DDGS diets. Overall, ADFI (2.51 vs 3.06 kg/d, $P < 0.01$) and ADG (0.81 vs 1.02 kg/d, $P < 0.01$) were reduced in the pigs fed diets with 30% DDGS, as compared to those fed the control diet. This was largely due to reduced gain and intake in the first 2 wk. Overall, barrows had higher ADFI and ADG than gilts. Changes in carcass characteristics were largely a reflection of the reduced final body weight of pigs fed diets with 30% DDGS and of gilts relative to barrows. The content of linoleic acid was higher in the inner, outer, leaf, and belly fat, and loin muscle of the pigs fed 30% DDGS. As a result of this change, calculated iodine value (IV) of all adipose tissue depots was greater in pigs fed DDGS, with the greatest change in belly fat (Control 69.9 vs. DDGS 79.1, $P < 0.01$). There was no change in the calculated IV of the lipid in loin muscle. The results of this study indicate that the addition of a saturated fat source did not overcome the effects of DDGS on the carcass. This was most likely due to the low digestibility of the saturated fat used in the study.

**Key Words:** carcass quality, lipid, unsaturated fat

## Production, Management and the Environment: Dairy

**340 Short dry period: A new reality? Results from a long term field study.** D. E. Santschi*[1,2], D. Lefebvre[3], C. L. Girard[1], and D. Pellerin[2], [1]*Agriculture and Agri-Food Canada, Sherbrooke, QC, Canada*, [2]*Université Laval, Quebec, QC, Canada*, [3]*Valacta, Ste-Anne-de-Bellevue, QC, Canada*.

The purpose of the present project was to verify the effects of two dry period length management practices on production and health of dairy cows in a large field study. Commercial dairy farms (n=13) were involved in this trial for 2 yr. Every two months and within each herd, Holstein cows (n=817) were randomly assigned to a SHORT (SDP; 35d, only pre-calving ration) or CONVENTIONAL (CDP; 60d, dry cow ration until d-21 then pre-calving ration) dry period management, based on parity, predicted 305d milk yield and calving interval. Actual dry period length was 38.2 and 65.8 ± 2.0d ($P<0.001$) for SDP and CDP, respectively. On average, SDP cows produced an extra 350 kg of milk before being dried off, compared to CDP cows. For 2nd lactation cows, incidence of ketosis was lower following the SDP (20 and 32% for SDP and CDP, respectively; $P=0.01$). For cows in their 3rd or greater lactation, incidence of retained placenta was increased (23 and 11% for

SDP and CDP, respectively; *P*=0.002), while udder edema was decreased (*P*=0.02) with SDP. There was no treatment effect on incidence of milk fever and displaced abomasum. Production responses are reported for cows which completed a whole lactation before January 30, 2009. Overall, milk yield for a 305d lactation period was not affected by the dry period management (10,185 ± 415kg; *P*=0.37) but yields varied according to parity (Table). Metabolic and preliminary production responses suggest that a 35d dry period management is suitable for today's dairy cows entering their 3rd or greater lactation.

**Table 1. Partial results for milk and component yields**

| | 2nd Lactation | | | | 3rd Lactation and greater | | | |
|---|---|---|---|---|---|---|---|---|
| | SDP | CDP | SE | P | SDP | CDP | SE | P |
| n | 62 | 62 | | | 86 | 83 | | |
| 305d lactation period (kg) | | | | | | | | |
| Milk | 9,412 | 9,942 | 433 | 0.03 | 10,865 | 10,762 | 394 | 0.64 |
| Fat | 360.5 | 375.8 | 17.3 | 0.09 | 417.6 | 405.7 | 19.1 | 0.18 |
| Protein | 316.2 | 322.3 | 12.7 | 0.38 | 346.7 | 338.7 | 12.2 | 0.20 |
| Total lactation (kg) | | | | | | | | |
| Milk | 9,896 | 10,425 | 548 | 0.11 | 11,507 | 11,258 | 445 | 0.41 |
| Fat | 383.4 | 395.6 | 21.8 | 0.35 | 446.1 | 428.1 | 21.4 | 0.16 |
| Protein | 335.7 | 340.2 | 17.3 | 0.69 | 372.0 | 358.1 | 14.4 | 0.16 |
| Lactation length (d) | 321.4 | 317.8 | 9.5 | 0.68 | 337.5 | 324.1 | 7.1 | 0.07 |

**Key Words:** dry period length, dairy cow, production

**341 Short dry period management improves peripartum ruminal adaptation in dairy cows.** M. S. Jolicoeur*[1,2], A. F. Brito[2], D. Pellerin[1], D. Lefebvre[3], R. Berthiaume[2], and C. L. Girard[2], [1]*Université Laval, Québec, QC, Canada*, [2]*Agriculture and Agri-Food Canada, Sherbrooke, QC, Canada*, [3]*Valacta, Ste-Anne-de-Bellevue, QC, Canada*.

The objective of this study was to investigate the effects of dry period length management (65 vs. 35 d) on lactational performance and energy balance from 65 d before to 60 d after calving. Holstein cows (n=12) were blocked according to parity, previous milk production and calving date and randomly assigned to either a conventional (CDP: 63.2 ± 2.0 d) or a short dry period (SDP: *35.2* ± 2.0 d). CDP cows were fed a far-off diet up to 28 d before calving, followed by a pre-calving diet, while SDP cows received only the latter diet. After calving, both groups were fed the same lactation diet. Milk yield and DMI were recorded daily and milk composition, weekly. Blood samples were taken twice a week during the first 4 weeks post-calving and weekly otherwise. Ruminal samples were collected 19.6 ± 1.1 d prior and 16.8 ± 1.2 d after calving within a 12 h feeding cycle. Before calving, treatments had no effect on DMI of pre-calving diet, plasma NEFA, BHBA and glucose (*P*>0.05). Plasma urea and ruminal pH were lower (*P*≤0.03) and total VFA concentration was higher for CDP (104.1 vs. 97.0 ± 2.5 mM; *P*=0.04). After calving, there was no treatment effect (*P*>0.05) on plasma glucose and urea, milk component yields and milk production (SDP=38.9; CDP=37.7 ± 1.49 kg/d). Milk fat content was lower (*P*=0.02) in SDP, 3.40 vs. 3.79 ± 0.12%. DMI was higher (*P*≤0.03) for SDP during the first 21 DIM (19.6 vs. 16.9 ± 0.9 kg/d). There was no treatment effect (*P*>0.05) on ruminal pH but total VFA was higher for SDP (114.2 vs. 103.7 ± 3.5 mM; *P*=0.001). Plasma NEFA (228 vs. 304 ± 22 μM) and plasma BHBA (0.71 vs. 0.83 ± 0.05 mM) were both lower (*P*≤0.02) in SDP than CDP cows. The decrease in milk fat content and plasma NEFA and BHBA in SDP cows without effect on milk yield suggest better energy balance likely due to an increased DMI. Results from the present study seem to indicate that reducing the stress associated with dietary changes during the dry period could facilitate ruminal adaptation and improve energy balance.

**Key Words:** dairy cow, dry period length, transition period

**342 Effect of a shortened dry period on the mammary gland physiology.** P. Bernier-Dodier*[1], B. G. Talbot[1], and P. Lacasse[2], [1]*Université de Sherbrooke, Sherbrooke, QC, Canada*, [2]*Dairy and Swine R&D Centre, Sherbrooke, QC, Canada*.

The objective of this study was to evaluate the effect of a shortened dry period (35 d vs 65 d) on milk production, on hormone release and on mammary cell proliferation, apoptosis and gene expression during the following lactation. Holstein cows (n=18) were assigned randomly to a conventional (CDP; n=9) or a short dry period (SDP; n=9). Cows were fed the same lactation diet both prior to and after the dry period. During the dry period, CDP cows were fed with a conventional dry period diet until 28 days before calving and then with a pre-calving diet, whereas SDP cows received only pre-calving diets for this period. Milk yield was measured at each milking from 85 d prior to calving to 150 DIM. During this period, serum samples were collected weekly and mammary biopsies were taken at 20 and 150 DIM. The dry period averaged 64.3±1.1 and 31.9±1.0 days for CDP and SDP, respectively. Cows in the SDP group had a lower milk yield than cows on CDP ($P < 0.05$). Interestingly, the mammary gland functional capacity (a measure of mammary gland volume) at 80 DIM was not significantly different ($P > 0.15$) averaging 31.4±1.5 and 28.6±1.5 L for CDP and SDP, respectively. Both groups had similar DMI in the weeks when both were dry and during the following lactation ($P > 0.15$). Serum level of growth hormone level were similar for both groups prior to calving and during the following lactation ($P > 0.15$). Mammary cell apoptosis and proliferation rates were evaluated, respectively, by TUNEL detection and by immunohistological detection of the Ki-67 antigen. Cows from both groups had similar rates of mammary cell apoptosis ($P > 0.15$) which averaged 0.18±0.05 and 0.22±0.04% at 20 DIM and 0.11±0.05 and 0.15±0.04%, at 150 DIM, for SDP and CDP, respectively. Likewise, mammary cell proliferation was unaffected by the dry period length and averaged 0.21±0.09 and 0.31±0.08% at 20 DIM and 0.36±0.09% and 0.38±0.08% at 150 DIM. Consequently, shortening the dry period reduced milk production during the subsequent lactation but did not seem to affect mammary gland functional capacity and the turnover rate of the mammary cells during the following lactation.

**Key Words:** dry period length, apoptosis

**343 Effects of heat stress and monensin on production and metabolism in lactating Holstein cows.** J. B. Wheelock*[1], S. R. Sanders[1], M. D. O'Brien[1], C. E. Moore[2], H. B. Green[2], M. R. Waldron[3], R. P. Rhoads[1], and L. H. Baumgard[1], [1]*University of Arizona, Tucson*, [2]*Elanco Animal Health, Indianapolis, IN*, [3]*University of Missouri, Columbia*.

Multiparous cows (n=34, 89 DIM; 537 kg) in environmental chambers were fed a control TMR or a TMR containing monensin (450 mg/cow/d) for 2 experimental periods (P): 1) thermal neutral (TN) conditions (constant 20°C ) and ad libitum intake for 9 d, and 2) heat stress

(HS, n=16) or pair-fed (PF; in TN, n=18) for 9 d. HS was cyclical with temperatures ranging from 29.4 to 38.9°C. Rectal temperatures and respiration rates increased in HS vs. PF cows (38.4 to 40.4°C and 40 to 93 bpm). HS reduced DMI (28%), and by design PF cows had similar intakes. Monensin fed cows consumed less DMI (1.59 kg/d) and this was independent of environment. Milk yield decreased 29% (9.1 kg) in HS and 15% (4.5 kg) in PF cows indicating reduced DMI only accounted for 50% of the decreased milk yield during HS. Monensin had no effect on milk yield in either environment. Both HS and PF cows entered into calculated negative energy balance (-2.7 Mcal/d) and had increased feed efficiency (16.5%) during P2. Feeding monensin increased feed efficiency (7%) regardless of environment. Glucose response to an epinephrine (EPI) challenge increased (27%) during P2 for both HS and PF cows while the NEFA response to the EPI was larger (106%) during P2 in the PF compared to the HS cows. Compared to P1, whole-body glucose rate of appearance (Ra) decreased during P2 in both HS and PF cows (646 vs. 514 mmol/h), but increased (15%) on a DMI basis in both HS and PF cows, suggesting an increase in glucose Ra from non-dietary substrates. Although producing similar quantities of glucose, HS cows synthesized ≈225 g less milk lactose, therefore on a milk yield basis, glucose Ra decreased (3.3%) in PF but increased (5.6%) in HS cows. Regardless of environment, monensin fed cows had increased (10%) glucose Ra on a DMI basis. Results suggest the liver remains sensitive but adipose tissue becomes refractory to catabolic signals and that glucose production is preferentially utilized for processes other than milk synthesis during HS.

**Key Words:** heat stress, monensin

**344 Effects of soaking dairy cows at the feed line on dry matter intake and milk production in a tunnel ventilated barn equipped with evaporative pads located in a tropical climate, Thailand.** D. V. Armstrong*[1], S. Rungruang[2], V. Wuthiranarith[2], M. J. Brouk[3], and J. F. Smith[3], [1]*University of Arizona*, *Tucson*, [2]*Charoen Pokphand Group Co., Ltd.*, *Bangkok, Thailand*, [3]*Kansas State University*, *Manhattan*.

An experiment was conducted using 86 lactating cows under 150 days in milk and grouped by days in milk and lactation number in two groups. Group 1 was sprayed with water every 5 minutes using approximately 1.65 liters in 30 seconds, for all 24 hours per day. Group 2 was a control group with no water spray. The trial lasted from February to August (26 weeks) and stopped when the first cows were dried off at 55 days before their due to calving date. The free stall barn was a tunnel ventilated barn with a center feed lane and was 16m by 113m with a ceiling height of 2.6m. The barn was equipped with 55.7 sq m of 2.4cm thick evaporative pads on one end and eleven 130cm fans on the opposite end of the barn. Total air exchange for the barn takes place every 42 seconds. Twenty nozzles were located every 1.87m on the feed lane at a height of 1.6m from the floor of the feed line. Outside the barn, temperatures during the trial reached daily highs of 27-34°C, and lows of 22-31°C. Temperatures inside the barn ranged from 23-25°C at 1300 and 17-25°C at 0400. Daily milk weights were collect and averaged by cow and week. Feed and feed refused was weighted daily and samples taken dairy for weekly analysis for D.M.%. Water nozzle performance was observed daily at 0800 and water output measured at the beginning of the trial and every 30 days. Eight of the control cows were removed for foot and leg injury, mastitis or indigestion. Three of the control cows were also removed for the same reasons. The feed intake data was not significantly different, controls averaged 20.60kg per day and spray line group 21.29kg. Milk production was higher for the spray groups in heifers and multiple lactation animals, 0 .85kg heifers and 0.87kg for the multiple lactation cows ( P=0.039). Although the numbers are small 90%, of the cows not pregnant before the trial started, were pregnant (17/19) at the end of trial, compared to 55% of the controls (11/20) or non spray animals, which would have an effect on milk production.

**Key Words:** heat stress, cow cooling, heat abatement

**345 Animal welfare in cross-ventilated and naturally ventilated dairy barns in the upper Midwest USA.** K. M. Lobeck*, M. I. Endres, E. M. Shane, S. M. Godden, and J. Fetrow, *University of Minnesota*, *St. Paul*.

The objective of this observational study was to describe animal welfare in low profile cross-ventilated freestall barns (CV) compared to conventional naturally ventilated freestall barns (NV) in the Upper Midwest. The study was conducted on 12 commercial dairy farms in Minnesota and eastern South Dakota with herd sizes ranging from 400 to 1600 lactating cows. All herds had stalls bedded with sand. Farms were visited once seasonally between January and November 2008 and approximately ninety percent of the lactating herd was scored on each visit for body condition, hygiene, hock lesion and locomotion. DHIA records were collected monthly. Body condition scores (1=emaciated, 5=severely obese) for winter, spring, summer, and fall, respectively, were (mean±SD): 3.07±0.27, 3.06±0.30, 2.97±0.36, 3.00±0.32 for NV herds; 3.10±0.29, 3.10±0.31, 3.04±0.36, and 3.04±0.37 for CV herds. Hygiene scores (1=clean, 5=dirty) were: 2.6±0.6, 2.5±0.5, 2.8±0.6, and 2.7±0.6 for NV herds; 2.6±0.6, 2.7±0.6, 3.0±0.6, and 2.9±0.5 for CV herds. Hock lesion percent prevalence for winter, spring, summer and fall (mild or severe lesion, respectively) was: 18.9, 6.7; 22.0, 9.3; 25.3, 8.7; 20.2, 6.0 for NV herds; 19.7, 8.9; 19.6, 12.0; 27.9, 11.7; and 18.1, 8.6 for CV herds. Lameness percent prevalence (lame or severely lame, respectively) determined by locomotion scoring (1=normal locomotion, 5=severely lame) was 18.7, 5.4; 19.7, 3.5; 13.2, 2.0, and 13.2, 2.5 for NV herds; 14.1, 3.8; 13.7, 1.3; 9.2, 1.2; and 9.5, 1.9 for CV herds. Somatic cell counts (x 1,000) were: 349±1020, 292±827, 294±827, and 269±713 for NV herds; 323±888, 280±731, 346±918, and 288±813 for CV herds. Cow comfort quotient (%) was 83.4±13.4, 86.5±7.0, 77.3±17.2, and 83.5±15.3 for NV herds; 89.0±10.5, 89.0±7.4, 85.5±14.6, and 88.7±5.2 for CV herds. Stall usage index (%) was 70.1±19.2, 74.7±9.3, 77.3±17.2, and 71.7±15.5 for NV herds; 77.1±11.0, 75.7±9.8, 72.6±16.5, and 77.2±8.4 for CV herds. Based on these results it appears that cross-ventilated and naturally ventilated freestall barns can provide relatively similar animal welfare conditions, but additional investigation and analysis are needed.

**Key Words:** housing, welfare, lameness

**346 Environmental characteristics in cross-ventilated and naturally ventilated dairy barns in the upper Midwest USA.** K. M. Lobeck*, M. I. Endres, E. M. Shane, and K. A. Janni, *University of Minnesota*, *St. Paul*.

The objective of this study was to characterize air quality, light intensity, and air velocity in low-profile cross-ventilated freestall barns (CV) compared to conventional naturally ventilated freestall barns (NV). The study was conducted on 12 commercial dairy farms in Minnesota and eastern South Dakota between January and November 2008. Each farm was visited seasonally for a total of four visits for the year. Representative measurements were taken with portable meters along the feed bunk and inside the pen twice daily. Measurements included

ammonia and hydrogen sulfide concentrations, light intensity, and air velocity. Ammonia concentrations (ppm, mean±SD) were 3.5±2.3 in the NV barns and 5.2±2.3 in the CV barns. Ammonia concentrations for winter, spring, summer, and fall, respectively were 1.9±2.19, 3.59±2.1, 5.6±1.3, and 2.9±1.5 for NV barns; 5.4±2.6, 5.0±2.4, 6.2±1.7, and 4.3±2.2 for CV barns. There were housing system and season($P \leq 0.001$), and system-season interaction ($P=0.039$) effects for ammonia concentrations. Hydrogen sulfide concentrations (ppb) were 24±26 for NV barns and 67±240 for CV barns. Seasonal concentrations of hydrogen sulfide were 40±27, 14±14, 30±35, and 13±11 for NV barns; 118±418, 56±179, 69±235, and 42±54 for CV barns. There were system and season effects ($P \leq 0.01$). Light intensity (lux) was 945.6±2200.6 for NV barns and 158.0±129.5 for CV barns. Seasonal light intensity was 827.4±616.6, 871.1±2293.4, 931.7±923.9, and 1130.8±3545.6 for NV barns; 214.4±193.1, 174.4±161.8, 144.6±83.4, and 131.5±80.3 for CV barns. There was a system effect ($P \leq 0.001$) and a trend for season effect ($P=0.057$). Air velocity (m/s) was 43.9±48.6 for NV barns and 56.6±50.5 for CV barns. Seasonal air velocity was 17.7±17.4, 44.1±38.5, 61.5±53.2, and 48.9±58.7 for NV barns; 15.1±10.8, 78.1±55.8, 84.7±48.5, and 39.8±35.0 for CV barns. There was no difference between systems for air velocity. However, there was a season effect ($P \leq 0.001$). These results indicate that there were some environmental differences between cross-ventilated barns and conventional naturally ventilated barns.

**Key Words:** housing system, air quality, light intensity

**347 Changes in body condition scores during the transition period in Holstein cows.** J. Moro-Méndez*, H. Monardes, and R. I. Cue, *McGill University, Department of Animal Science, Ste-Anne-de-Bellevue, QC, Canada*.

The objectives were to characterize body condition scores (BCS) on Holstein cows by studying two overlapping stages (before and after drying-off, and during the transition period) and to determine the relative importance of some environmental factors on BCS. Data were provided by Valacta, and consisted of BCS recorded on a 5-point scale (1=thin, 5=obese). The statistical analysis of BCS before and after drying-off included BCS records collected between 60 days before and after drying-off. After edits there were 11784, 10778 and 7840 records of first, second, and third parity cows, respectively. Analysis of BCS during the transition period included records of cows with consecutive pairs of lactations for each transition period (i.e. first to second, second to third, and third to fourth lactations). Only one BCS record per cow per lactation, collected between 90 days before and 21 days after calving, was kept. After edits, there were 8321, 6503, and 4313 records of first to second, second to third, and third to fourth parities, respectively. Two models, using SAS Proc Mixed, were fitted with the following fixed effects: Herd-Year-Season of calving (HYS), calendar month of BCS recording, age (either at drying-off or at calving of the lactation being transitioned into), days (either, dry days, or transition days), and level of milk production. BCS increased after drying-off, decreased just before calving and there was an increase from the nadir at 45 days post calving. Days dry and transition days were highly significant in all parities under study. In contrast with average cows, lower and higher producing cows in the previous lactation showed lower BCS in the subsequent lactation. Level of production and HYS were the main environmental factors affecting BCS during the dry and transition periods. The recording system of body condition score in Quebec provides information suitable for the analysis of BCS throughout the lactations of Holstein cows.

**Key Words:** body condition score, drying-off, transition period

**348 The association of level of milk production with reproductive performance.** M. S. Campbell[1], K. Hand[1], D. F. Kelton[1], F. Miglior[2,3], and S. J. LeBlanc*[1], [1]*University of Guelph, Guelph, ON, Canada*, [2]*Canadian Dairy Network, Guelph, ON, Canada*, [3]*Dairy and Swine Research & Development Centre, Agriculture and Agri-Food Canada*.

There is debate about possible antagonism between high milk production and reproductive performance in dairy cattle. The objectives were to examine the association of the level of production with reproductive performance at the herd and animal levels. Data were extracted from all 6326 herds on milk recording in Ontario and western Canada. There were 3297 herds with complete AI and pregnancy data for the year 2005 to which herd demographics, production, milking frequency and housing type were added. Herd annual mean (SD) 21-d pregnancy rate (PR), insemination rate (IR) and conception risk (CR) were 12.5 (4.7), 33.9 (10.5) and 37.2 (9.9), respectively. Herd PR was modeled with mixed linear regression with random herd effect. Accounting for herd size, parity distribution, breed, and housing, each 1000 kg of herd mean mature equivalent milk was associated with an increase of 0.7 points of PR ($P < .0001$). Individual data (at least the first 3 test days (TD)) were available for 103,060 cows in 2076 herds. Times to first AI and to pregnancy were modeled with survival analysis with a random herd effect. Production was described by kg of milk and 305 d projections at TD 1, 2, and 3, and completed 305 d records, each of which had a significant univariable association with shorter time to pregnancy. Milk yield at TD1 was not associated with time to first AI. In the final model accounting for parity, season of calving, and DIM at TD, there was a small association of increased milk yield at TD1 with longer time to pregnancy (hazard ratio (HR) = 0.997 per kg, P = .02) and in the same model increasing 305 d projection at TD3 was associated with shorter time to pregnancy (HR = 1.07 per 1000 kg, $P < 0.0001$). In summary, herd pregnancy rate was significantly higher in higher producing herds, and for individual cows there were significant but conflicting and practically small effects of level of production on time to pregnancy. These results suggest that managing to provide for high production can be compatible with good reproductive performance.

**Key Words:** reproduction, fertility, milk yield

**349 Management practices associated with conception rate and service rate of lactating Holstein cows in large, commercial dairy herds.** J. M. Schefers*[1], K. A. Weigel[1], N. B. Cook[1], C. L. Rawson[2], and N. R. Zwald[2], [1]*University of Wisconsin, Madison*, [2]*Alta Genetics USA Inc., Watertown, WI*.

Data from lactating Holstein cows in herds that participate in the Alta Genetics (Watertown, WI) Advantage® progeny testing program were analyzed to explain management factors associated with herd average conception and service rates on large commercial dairies. Dairy Comp 305 herd management software (Valley Ag Software, Tulare, CA) was used as the source of data related to production, reproduction, culling, and milk quality for 108 herds. Also, a survey regarding management, facilities, nutrition, and labor was completed by Alta Genetics Advantage® consultants on 86 farms. A total of 42 explanatory variables related to management factors and conditions that could affect conception and service rate were considered in this study. Models explaining conception and service rates were developed using a machine learning algorithm for constructing model trees. The most important explanatory variables associated with conception rate were the percentage of repeated inseminations between 4 and 17 d post artificial insemination, stocking density in the breeding pen, length of the voluntary waiting period, and somatic cell score. The most important explanatory variables associated with

service rate were the number of lactating cows per breeding technician, use of a resynchronization program, utilization of soakers in the holding area during the summer, and bunk space per cow in the breeding pen. The aforementioned models explained 35% and 40% of the observed variation in conception rate and service rate, respectively.

**Key Words:** reproductive performance, management, machine learning

**350 Pregnancy rates and herd turnover proportions after using a hormonal synchronization protocol in primiparous dairy cows in a California dairy.** K. G. Gohary*[1], S. S. Aly[2], D. C. Wagner[1], B. R. Hoar[2], V. M. Lane[3], and J. D. Rowe[3], [1]*William R. Pritchard Veterinary Medical Teaching Hospital, School of Veterinary Medicine, University of California, Davis*, [2]*Department of Veterinary Medicine and Epidemiology, School of Veterinary Medicine, University of California, Davis*, [3]*Department of Population Health and Reproduction, School of Veterinary Medicine, University of California, Davis*.

The objective of this trial was to evaluate the effect of hormonal synchronization on pregnancy rate (PR) and herd turnover (HT) proportions in primiparous dairy cows. To accomplish this goal a clinical trial was designed to estimate the pregnancy incidence density (PID) rate after up to 3 inseminations, median time to pregnancy and herd turnover proportions in the current and subsequent 2 lactations. A cohort of primiparous Holstein cows (n=333) housed in a freestall dairy in the central valley of California was selected. Cows were systematically enrolled into 2 groups. Cows in the treatment group (n=178) received 100µg of gonadotropin-releasing hormone (GnRH) on day 0, 25mg of prostaglandin $F_{2\propto}$ ($PGF_{2\propto}$) on day 7 and a second GnRH treatment (100µg) on day 9 and were artificially inseminated after 16 hours regardless of heat signs. Cows in the control group (n=155) were inseminated upon heat detection or observation of rubbed tail chalk without receiving hormonal treatments unless warranted for pathological reasons. Veterinarians were unaware of cow group allocation during herd checks. Median time to pregnancy was less for the treatment group than the control group (53 days versus 87 days, *P*=0.023). Although not significant, the PID ratio of the treatment group to the control group was 1.13 (*P*=0.46) indicating a 13% higher PR among synchronized cows than controls. In contrast, PID ratio for cows enrolled with a body condition score (BCS)<2.5 was 1.55 indicating that under-conditioned cows had a 55% higher PR when synchronized compared to control cows of similar BCS (*P*=0.34). However, synchronized cows with 2.5 to 3.5 BCS had only a 4% greater PR than controls of similar BCS (*P*=0.82). Proportion of HT after the first, second and third lactations and overall after 3 lactations did not differ among treatment and control groups (*P*=0.14). In summary, hormonal synchronization in primiparous cows reduced the median time to pregnancy, may be of benefit to under-conditioned cows, and had no significant effect on herd turnover in current and subsequent lactations

**Key Words:** primiparous dairy cows, hormonal synchronization, pregnancy rates

**351 Effect of days open in the previous lactation on the risk of culling or death around calving.** P. J. Pinedo* and A. De Vries, *University of Florida, Gainesville*.

The objective was to evaluate the effect of days open (days to conception) on the risk of culling and death in the proximity of a subsequent calving in Holstein cows enrolled in the DHI program. After edits, 6,974,152 observations of cows calving between 2000 and 2006 in herds located in 38 states in the Eastern US were available. The period at risk included the time between 14 d before expected calving and 60 d after calving. Days open were categorized in 6 periods; 0 to 45 d, 46 to 90 d, 91 to 150 d, 151 to 210 d, 211 to 300 d, and 301 to 600 d. Other variables of interest included parity, last test day milk yield prior to dry off, last test day milk yield by 60 d after calving, season of calving, and 305-d milk production. Control variables were calving year, herd size, and herd milk production. All variables were categorized. Generalized mixed models were used and included herd as random effect. Interactions between days open and the variables of interest were included in the final model if P â‰¤ 0.10. Least square means (LSM) for the risk of death were 1.01, 1.00, 1.13, 1.27, 1.58, and 2.00%, for increasing categories of days open. Similarly, for the same categories, LSM for the risk of culling (excluding death) were 2.07, 2.19, 2.31, 2.50, 2.69, and 3.07%. Least square means for the risk of culling and death combined (CD) were 2.78, 3.70, and 5.11% for parity 2, 3 and â‰¥4, respectively. For the risk of CD, LSM were 4.52, 3.54, and 3.29% for low, medium or high test day milk yield prior to dry off, and were 10.2, 2.66 and 1.87% for low, medium or high test day milk yield by 60 d after calving. The effect of days open on the risk of culling was slightly greater for lower parity cows, for cows with greater test milk yield prior to dry off, for lower test milk yield by 60 d after calving, for winter calvings, and for lower 305-d milk production in the previous lactation. Similar trends for these interactions were found for the risk of death. It is concluded that increased days open in the previous lactation were associated with a greater risk of culling and death around calving.

**Key Words:** culling risk, death risk, days open

## Ruminant Nutrition: Fat Supplementation

**352 Effective use of safflower seeds in early lactation diets with alfalfa hay and corn silage.** A. Alizadeh[1], G. R. Ghorbani[1], M. Alikhani[1], H. R. Rahmani[1], and A. Nikkhah*[2], [1]*Isfahan University of Technology, Isfahan, Iran*, [2]*Zanjan University, Zanjan, Iran*.

Safflower seed (SS), *Carthamus tinctorius* L., has the highest concentration of linoleic acid among 80 oilseeds. We hypothesized that SS can be effectively fed with cottonseeds (CS) in diets with dry hay and ensiled forage to maintain feed intake, energy metabolism and productivity of early lactation cows under negative energy balance. Our objective was to determine the effects of feeding diets containing 1) 10% whole CS with no SS (SS0), 2) 7.5% CS + 2.5% SS (SS2.5), and 3) 5% CS + 5% SS (SS5), on a DM basis, on feed intake, rumen fermentation, blood metabolites and lipids, and milk production. Nine multiparous early lactation Holstein cows (46 ± 7 days in milk) were used in a replicated 3 × 3 Latin square design study with 21-d periods. Each period had 14-d of adaptation followed by 7-d of data collection. Cows were fed isoenergetic and isonitrogenous total mixed rations, based on alfalfa hay, corn silage, and barley and corn grains, twice daily at 0900 h and 1600 h. Data were analyzed using mixed models with the fixed treatment effect and random period and cow effects. Feeding SS0, SS2.5 and SS5 diets did not respectively affect dry matter intake (23.3, 24.1, 22.8 kg/d, P=0.42), rumen pH (6.58, 6.49, 6.55, P=0.86) and ammonia (9.4, 8.5, 8.5 mg/dl, P=0.24) and VFA concentrations, blood levels of