

1046 Food safety in the retail ice cream (soft serve) market. I. Okpala*¹, ¹Michigan State University, Lansing, MI, ²Michigan Department of Agriculture, Lansing, MI.

In 1983, the Michigan legislature adopted changes in the Frozen Desserts Act, Act 298, Public Acts of 1968, as amended, which eliminated the need for the Michigan Department of Agriculture (MDA) to license, sample and inspect those facilities which manufactured frozen desserts in a food service setting. Since all food service establishments are licensed and inspected by the local health department, this decision was based on the fact that a food service facility should not be inspected by two regulatory agencies. Local health departments were not provided with the resources necessary to deal with the added responsibility and very little work has been done to monitor the quality of soft serve products manufactured at food service establishments. Many local health agencies do not have laboratories in which food products can be analyzed and have not set up sampling and inspection procedures for the frozen dessert part of food service establishments. MDA, therefore continues to license, inspect and sample those establishments not covered by the Public Health code. In cooperation with local health departments, a soft serve risk assessment survey was conducted. The results of the sampling and survey will be used to: 1) to determine and characterize the type and baseline levels of microbiological organisms which are found in soft serve desserts, 2) assess the effectiveness of sanitation practices currently used in soft serve production and to determine if establishment practices have an impact on these levels, and 3) to justify the changes that the Michigan Department of Agriculture made to the state dairy laws.

1047 Prevalence and distribution of *Campylobacter* spp. in a swine slaughter and processing facility. R Pearce¹, R Dudley², F.M. Wallace*², J.E. Call², and J.B. Luchansky², ¹The National Food Centre, Teagasc, Dunsinea, Castleknock, Dublin, Ireland, ²USDA, Agricultural Research, Eastern Regional Research Center, Wyndmoor, PA.

The objective of this study was to establish the prevalence and distribution of *Campylobacter* spp. in a swine slaughter and processing facility. Samples obtained over the course of three visits included composite carcass samples (30), representing 360 swine carcasses, obtained at selected points along the slaughter process, matching composite rectal samples (30), and non-matching individual colon samples (60). In addition, samples were collected on the same three visits from equipment used in the slaughter and processing operations. A preliminary study to determine the most efficient recovery method showed that direct plating onto Campy-Line agar (CLA) recovered *Campylobacter* spp. at a significantly higher ($P < 0.05$) rate when compared to three other recovery methods. Using CLA, *Campylobacter* spp. were detected on 33% (10/30) of carcasses immediately after stunning, 0% (0/30) after flaming/polishing, 3% (1/30) immediately before chilling and 0% (0/30) after overnight chilling. The pathogen was recovered from 63% (19/30) of the composite rectal samples which were collected from carcasses immediately after stunning, and 58% (35/60) of the individual colon samples which were collected following carcass evisceration. *Campylobacter* spp. were detected on dehairing equipment used in the slaughter process but were not detected on equipment used in the processing operation. The results of this study show that direct plating onto CLA is an effective recovery method for *Campylobacter* spp. Additionally, the results indicate that the prevalence of *Campylobacter* spp. is reduced as hog carcasses progress through the slaughtering process.

Key Words: *Campylobacter*, Swine, Prevalence

1048 Evaluation of bacteriophage DC22 for control of *Escherichia coli* O157:H7. S.J. Bach*¹, T.A. McAllister¹, D.M. Veira², V.P.J. Gannon³, and R.A. Holley⁴, ¹Agriculture and Agri-Food Canada, Lethbridge, AB, ²Agriculture and Agri-Food Canada, Kamloops, BC, ³Health Canada, Animal Diseases Research Institute, Lethbridge, AB, ⁴University of Manitoba, Winnipeg.

The effectiveness of DC22, an *Escherichia coli* O157:H7-specific bacteriophage, for controlling *E. coli* O157:H7 was investigated in vitro, using the Ruminal Simulation Technique (Rusitec) and in vivo, with experimentally inoculated wethers. In Exp. 1, fermentations were established in eight Rusitec vessels using ruminal inoculum confirmed negative for *E. coli* O157:H7. Each vessel was inoculated with 10^4 CFU/mL of *E. coli* O157:H7 strain 3081, then 8 h later with 10^5 PFU/CFU of DC22 or an equivalent amount of SM buffer as a control ($n = 4$). Both *E. coli* O157:H7 and phage DC22 were enumerated 4 and 12 h after inoculation of DC22, and daily thereafter for 7 d. In the DC22-treated vessels, *E. coli* O157:H7 was eliminated within 4 h of challenge, whereas the bacterium persisted in the control vessels for up to 168 h ($P < 0.05$). In Exp. 2, 12 wethers were inoculated orally with 10^8 CFU of *E. coli* O157:H7 strain E318N, then 2 d later, with 10^5 PFU/CFU of DC22 or an equivalent amount of SM buffer ($n = 6$). Fecal samples were collected for enumeration of *E. coli* O157:H7 and DC22 following inoculation and following DC22 challenge, then daily for 8 d, then twice weekly for 3 wk. Treatment with DC22 did not affect ($P > 0.05$) levels of *E. coli* O157:H7 shed by the wethers during the 30-d period. Levels of DC22 recovered from feces decreased rapidly following inoculation, suggesting the phage did not replicate lytically in the ovine gut. Although 10^5 PFU of DC22/CFU *E. coli* O157:H7 was adequate for eliminating *E. coli* O157:H7 in the Rusitec ($P < 0.05$), this dose did not effect maintenance of the phage in the gastrointestinal tract of the wethers in levels sufficient to cause lysis of *E. coli* O157:H7. Non-specific adsorption of DC22 may have reduced its availability to lyse *E. coli* O157:H7. Bacteriophage DC22 was not effective for controlling fecal shedding of *E. coli* O157:H7 by sheep.

Key Words: Bacteriophage, *E. coli* O157:H7, Sheep

1049 Antimicrobial activity of ginkgo biloba and Origanox on *Escherichia coli* O157:H7 and *Salmonella agona*. H. Nasri, S. A. Ibrahim*, T. N. Evans, T. Jordan, C. W. Seo, and G. Shahbazi, North Carolina A&T State University, Greensboro, NC.

The Pathogen Reduction Program of the U.S. Department of Agriculture Food Safety and Inspection Service recommends antimicrobial treatments including herb extracts to reduce or inactivate pathogenic bacteria in foods. Ginkgo Biloba (GB) and Origanox (OX) have been used in foods as functional ingredients. However, they have never been used as antimicrobial agents. Therefore, the objective of this study was to evaluate the effect of GB and OX on the survival and growth of *Escherichia coli* O157:H7 and *Salmonella agona* in BHI broth. Prior to media sterilization select concentrations of GB and OX extracts were added separately into the broths. *E. coli* O157:H7 (380-94), and two strains of *Salmonella agona* (F5567, H6115) were inoculated to provide a final inoculum level of 2.5×10^2 CFU/ml. Samples were incubated at 37°C for 6 hours. Samples were withdrawn every 2 hours and surface plated on EMB agar and TSBYE agar for the enumeration of *E. coli* and *Salmonella*, respectively. Results showed that the addition of 1.25% GB and 0.1% OX significantly inhibited the growth of pathogenic bacteria ($P < 0.05$). During the 6 hours storage period, populations of bacteria increased by 6.0 log CFU/ml in control samples while bacterial populations in treated samples only increased by 2.0 log CFU/ml. These results indicate the potential applicability of GB and OX as antimicrobials in foods.

Key Words: *Salmonella agona*, Ginkgo biloba, Origanox

Physiology Estrus Synchronization

1050 Postpartum suppression of ovarian activity with a Deslorelin implant enhanced uterine involution in lactating dairy cows. F.T. Silvestre*¹, J.A. Bartolome¹, S. Kamimura¹, A. C. M. Arteché¹, S.M. Pancarci¹, T. Trigg², and W.W. Thatcher¹, ¹University of Florida, Gainesville, FL, USA, ²Peptech Animal Health, North Ryde, Australia.

Ovarian follicular activity, presence of a CL and uterine involution were evaluated for cows treated with a non-degradable Deslorelin (DES) im-
262

plant (5 mg; $n = 10$) or a control group ($n = 9$) that did not receive an implant. All cows were assigned randomly to treatments on 6-25-2001 and received DES implants between 1d to 4d postpartum (PP). Cows

had normal parturitions without dystocia, retained fetal membranes, or milk fever. Ultrasound (US) was used to monitor number of ovarian follicles (Class 1, ≤ 5 mm; Class 2, 6-9 mm; Class 3 ≥ 10 mm, and number of CL) ipsilateral and contralateral to the previous pregnant horn (PH) on days 21, 28 and 35 after enrollment. Diameters of uterine horns at 4 cm past the intercornual ligament and cervix were measured by US, in addition vaginal endoscopy evaluated cervical discharge and color on days 14, 21, 28 and 35 after enrollment. The DES implant increased Class 1 follicles ($10.6 \pm 0.51 > 5.3 \pm 0.52$; $P < 0.01$) and decreased the number of Class 2 ($0.0 \pm 0.19 < 0.9 \pm 0.2$ $P < 0.01$) and Class 3 follicles ($0.0 \pm 0.19 < 1.3 \pm 0.20$; $P < 0.01$). DES implant decreased the number of CL ($0.0 \pm 0.09 < 0.45 \pm 0.1$; $P < 0.01$). Ovarian activity was suppressed due to the DES implant group based upon a lack of Class 2 and 3 follicles that are dependent upon gonadotrophin secretion. Uterine horn diameter was influenced by DES implant ($P < 0.01$), PH ($P < 0.01$), DES implant*PH ($P < 0.10$) and day*PH ($P < 0.02$). DES implant inserted at 1-4 days PP reduced size of the PH (see table). Cows with the DES implant had a lower frequency of a purulent discharge from the cervical os. In conclusion, suppression of ovarian activity during the early PP period stimulated rate of uterine regression in clinically normal cows. Such a treatment warrants further study relative to improving uterine health and fertility in both clinically normal and abnormal cows.

Day Control PH (cm) Des Implant PH (cm)

| | | |
|----|-----------------|-----------------|
| 14 | 3.17 \pm 0.16 | 2.60 \pm 0.17 |
| 21 | 2.93 \pm 0.16 | 2.15 \pm 0.17 |
| 28 | 2.66 \pm 0.16 | 2.16 \pm 0.17 |
| 35 | 2.54 \pm 0.16 | 2.23 \pm 0.17 |

Day Control PH (cm) Des Implant PH(cm) 14 3.17 0.16 2.6 0.17 21 2.93 0.16 2.15 0.17 28 2.66 0.16 2.16 0.17 35 2.54 0.16 2.23 0.17

Key Words: Deslorelin implant, uterine involution, follicle development

1051 Effect of bovine somatotropin on ovarian function and pregnancy in nonlactating dairy cows. S Kamimura*, T.R. Bilby, S.M. Pancarci, A. Guzeloglu, and W.W. Thatcher, *University of Florida*.

The use of bST has been associated with a decrease in reproductive efficiency. However, it was reported that bST injection in combination with the Ovsynch timed insemination program (TI) stimulated pregnancy rate at first insemination in lactating cows. Objective of this study was to characterize effects of bST on ovarian function and pregnancy in nonlactating dairy cows. Cows (n=59) were injected on d#10 (d0 = TI) with GnRH (100 μ g, im, Cystorelin[®]; Merial Ltd) followed 7d later (d-3) by an injection of PGF_{2 α} (25mg, im, Lutalyse[®]; Pharmacia Corp.). At 48 h after injection of PGF_{2 α} , GnRH (d-1) was administered, and 38 cows were inseminated 16 h later. The cycling group (n=21) was not inseminated. On d0 and d11, cows received either bST (500mg, sc, Posilac[®]; Monsanto Co.; n=41) or no bST (n=18). Ovaries were evaluated by ultrasound on d0, d7 and d16 to characterize number of class 2 (6 # 9 mm) and 3 (>10 mm) follicles and corpora lutea (CL) length (mm). A follicular cyst was detected on d0 in 7 cows and in 5 additional cows on d7. CL regression prior to d16 was observed in 2 cows. These 14 cows were not slaughtered. A total of 45 cows (14 cyclic and 31 TI) were slaughtered on d17 and uteri of cyclic and TI cows were flushed with 40 ml of PBS to recover uterine flushings and verify presence of conceptus. BST effect on ovarian function of 47 noncystic cows was evaluated using repeated measures analysis of mixed model SAS. The 12 cystic cows were evaluated independently. Conceptuses were recovered from 4/21 bST cows (19%) and 6/10 (60%) control cows ($P < 0.01$); conceptus were 49.7 \pm 7.0 cm in bST treatment and 24.5 \pm 5.0 cm in control ($P < 0.02$). Number of class 2 and 3 follicles, and size of largest follicle did not differ between treatments. Treatment with bST stimulated CL weight at slaughter (5.8 > 5.1 g; $P < 0.01$) and CL length (25.2 \pm 0.5 > 23.5 \pm 0.7 mm) as measured by ultrasound on d7 and d16. The incidence of follicular cysts was not influenced by bST treatment. In summary, bST treatment decreased pregnancy rate and increased CL length, CL weight, and conceptus length in nonlactating dairy cows.

Key Words: Somatotropin, Pregnancy, Nonlactating dairy cows

1052 Effect of a deslorelin implant in a timed AI protocol on follicle development, luteal activity and reproductive performance of dairy cows. J.E.P. Santos*¹, J. Bartolome², R.L.A. Cerri¹, S.O. Juchem¹, T.E. Trigg³, and W.W. Thatcher², ¹University of California Davis, ²University of Florida, ³Peptech Animal Health, Australia.

After blocking for lactation, BCS, and milk production, 596 Holstein cows were assigned randomly to one of two treatments at 303 DIM. Cows received PGF_{2a} (Pharmacia Co.) injections at 303 and 443 DIM. At 583 DIM, cows received a GnRH (Merial Ltda.) injection followed 7 d later by a PGF_{2a} injection. At 48 h after the last PGF_{2a}, cows received either a GnRH injection (100 ug of Gonadorelin) or a GnRH agonist (Deslorelin, 450 or 750 ug) and were timed AI (TAI) 12 to 16 h later. Blood samples were collected at -24, -10, and 11 d relative to the day of AI for progesterone (P₄) determination. Pregnancy was diagnosed by ultrasound at d 27 after AI and reconfirmed 14 d later. Follicular populations and presence of CL were determined for open cows at d 27 after AI. Open cows were resynchronized with initiation of the Ovsynch protocol at d 27 after AI. At the day of the PGF_{2a} during resynchronization, follicular populations and presence of CL were determined. Continuous and binomially distributed data were analyzed using the GLM and the LOGISTIC procedures of SAS, respectively. Conception rates (CR) for DES and GnRH did not differ ($P > 0.15$) at days 27 (33.4 vs 37.9%) and 41 (30.3 vs 31.2%). Pregnancy losses from d 27 to d 41 were less for the DES group (6.7 vs 15.7%; $P < 0.03$). Plasma P₄ (ng/ml) on d 11 after AI was similar for DES and GnRH (9.75 vs 9.67; $P < 0.90$). In open cows, compared with GnRH, DES reduced the number of follicles sized 6 to 9 mm (0.9 vs 2.0; $P < 0.001$) and 10 to 19 mm (0.5 vs 1.2; $P < 0.001$) at d 27 after AI. Size of the largest follicle 48 h prior to the resynchronized TAI in cows diagnosed open at d 27 was smaller for DES treated cows compared with GnRH (12.3 vs 14.3 mm; $P < 0.03$). DES increased the re-insemination interval for open cows found in estrus after the first AI compared with GnRH (25.1 vs 21.4; $P < 0.001$). Conception rate to the re-synchronized TAI was decreased in DES treated cows (10.8 vs 26.2%; $P < 0.01$). Replacement of GnRH with a Deslorelin implant (450 ug) for a TAI protocol reduces pregnancy loss, but inhibits follicle development and decreases fertility in the subsequent estrous cycle.

Key Words: Reproduction, Timed AI, Deslorelin

1053 Effect of presynchronization on conception rate to a timed artificial insemination protocol in lactating dairy cows. C. Navanukraw*¹, L.P. Reynolds¹, A.T. Grazul-Bilska¹, D.A. Redmer¹, and P.M. Fricke², ¹Department of Animal and Range Sciences, North Dakota State University, Fargo, ND, 58105-5727, ²Department of Dairy Science, University of Wisconsin-Madison, Madison, WI, 53706.

Presynchronization using two injections of PGF_{2 α} (PGF) 14 d apart beginning 26 d before Ovsynch has been shown to increase conception rate to timed artificial insemination (TAI) in lactating dairy cows compared with Ovsynch alone (J. Dairy Sci. 84:1646; 2001). To assess presynchronization using two injections of PGF 14 d apart beginning 28 d before Ovsynch, nonpregnant lactating Holstein cows (n=257) >60 days in milk (DIM) were blocked by parity (1st vs. >1st parity) and DIM (>60-100 vs. >100 DIM) and were randomly assigned within block to one of two treatments: Ovsynch (n=128) received 50 mg GnRH (d -10), 25 mg PGF (d -3) and 50 mg GnRH (d -1) beginning at a random stage of the estrous cycle; Presynch (n=129) received two injections of PGF (25 mg/injection) 14 d apart beginning 28 d before Ovsynch (i.e., on d -38 and -24 of the Ovsynch protocol). All cows received TAI (d 0) 18 h after the second GnRH. Transrectal ultrasonography was used to assess ovulatory response to each GnRH (first 109 cows) and also to assess pregnancy status 42 d after TAI (all cows). Cows were considered synchronized if the CL regressed after the PGF of the Ovsynch protocol and a follicle >10 mm in diameter disappeared within 48 h after the second GnRH. Although the proportion of cows ovulating after the first and second GnRH did not differ between treatments (41.1 and 69.6 vs. 35.9 and 81.1% for Ovsynch vs. Presynch, respectively; $P = 0.58$ and 0.17; n=109), conception rate was greater ($P < 0.08$) for Presynch vs. Ovsynch (48.1 vs. 37.5%; n=257). Parity, DIM, or body condition score at TAI did not affect conception rate. These data support the use of this modified Presynch protocol to increase conception rate of lactating dairy cows receiving TAI. Supported in part by Hatch projects ND01705 to DAR and LPR and WIS04222 to PMF.

Key Words: Ovsynch Presynch, TAI, Lactating Dairy Cows

1054 Effect of a single progesterone injection on ovarian follicular cysts in lactating dairy cows. T. B. Hatler*, S. H. Hayes, A. M. Nugent, D. W. Yelton, and W. J. Silvia, *University of Kentucky, Lexington.*

The objective was to evaluate the influence of a single injection of progesterone on ovarian follicular cysts and examine subsequent occurrence of new cyst formation or ovulation. Ovarian follicular cysts (follicle diameter ≥ 20 mm) were detected via palpation per rectum as part of routine reproductive management of nonpregnant, lactating Holstein and Jersey cows. The ovaries of cystic cows were examined by transrectal ultrasonography three times weekly to monitor formation of new follicular cysts. Venous blood samples were collected daily for quantification of progesterone. Newly formed follicular cysts were subjected to treatment between 3 and 9 days after attaining a diameter of 20 mm. Treatment consisted of an intramuscular injection of 200 mg of progesterone (P4, n=15 cysts) or corn oil vehicle (V, n=7 cysts). Blood sampling and ultrasonography continued until ovulation occurred or a new follicular cyst formed. Progesterone treatment increased circulating concentrations of progesterone at 1 ($P < 0.01$; 1.03 vs. 0.24 ng/ml) and 2 ($P < 0.01$; 0.67 vs. 0.25 ng/ml) days post-treatment. Progesterone treatment reduced the lifespan of the cyst (number of days the diameter of the cyst ≥ 20 mm) by 12 days ($P < 0.01$; 29 vs. 17 days). Treatment tended to alter the frequency of subsequent follicular events ($P < 0.10$). Ovulation occurred after 6 of 15 cysts were treated with P4. Ovulations occurred 11.8 ± 1.8 days after treatment. In no case was V treatment followed by ovulation. New cysts replaced 9 of 15 P4-treated cysts, whereas a new cyst replaced 7 of 7 V-treated cysts. These new cysts reached cystic diameter at 19.6 ± 3.5 and 19.1 ± 3.0 days after treatment, respectively. In conclusion, a single injection of 200 mg of progesterone early in the life of an ovarian follicular cyst shortened its lifespan and in some cases, was followed by ovulation of a new follicle. Research was supported by USDA (00-35203-9174).

Key Words: Ovarian follicular cyst, Progesterone treatment

1055 Ovarian follicular activity in lactating Holstein cows supplemented with monensin. S. K. Tallam*¹, T. F. Duffield¹, K. E. Leslie¹, R. Bagg², and J. S. Walton¹, ¹*University of Guelph, Guelph, Ontario, Canada,* ²*Elanco Animal Health, Division Eli Lilly Canada Inc., Guelph, Ontario, Canada.*

The effects of monensin on postpartum ovarian follicular development, reproductive performance, feed intake and milk production were studied in multiparous Holstein cows. Cows were randomly assigned either a control TMR diet (C, n=19) at NRC requirements or the same diet including 22 ppm monensin (M, n=18). The diets were offered *ad libitum* from 21 days prior to the anticipated date of calving until the cows were either confirmed pregnant (Day 40 of pregnancy) or were > 180 days postpartum. Monensin had no effect on development of the first postpartum dominant follicle or the numbers of smaller follicles. Control cows had a greater number of class 4 (> 15 mm) follicles than the M group ($P < 0.05$). The first postpartum dominant follicle ovulated (M, 72.2%; C, 68.4%), regressed (M, 11.1%; C, 21.1%) or became cystic (M, 16.7%; C, 10.5%) with no effects of diet. The first postpartum ovulation occurred earlier (M, Day 27.2 ± 2.1 ; C, Day 32.4 ± 1.5) in monensin-fed cows than in the control group ($P < 0.05$) with no diet effects on the diameter of the ovulating follicle (M, 17.3 ± 2.2 mm; C, 21.0 ± 2.0 mm). Treatments did not differ in the proportion of cows with 2 or 3 waves of ovarian follicular development per cycle nor in the number of follicles of all classes during the breeding period. Times to ovulation following prostaglandin $F_{2\alpha}$ administration (M, 92.4 ± 3.6 h; C, 94.8 ± 3.9 h) were not different between M and C. Pregnancy rates after TAI based on ultrasound diagnosis on day 28-35 after service showed no diet effects. Cows receiving the monensin diet had lower ($P < 0.05$) milk protein and fat concentrations although milk fat and protein yields were not different ($P > 0.05$) between diet groups. This study suggests earlier resumption of normal ovarian follicular activity resulting in earlier ovulation in monensin-fed than in control cows.

Key Words: Postpartum, Follicular development, Monensin

1056 Use of milk letdown after prostaglandin $F_{2\alpha}$ to initiate OVSYNCH in lactating dairy cows. B.R. Keith*, J.S. Walton, K.E. Leslie, and W.H. Johnson, *University of Guelph, Guelph, Ontario, Canada.*

Milk letdown (ML) occurs in response to luteolysis induced by $PGF_{2\alpha}$ injection, and may be used as a test to determine stage of the estrous cycle. The objective of this study was to evaluate if initiating OVSYNCH (GnRH-7d- $PGF_{2\alpha}$ -2d-GnRH-24hr-AI) at the most beneficial time of the cycle (day 5-9), on the basis of this test, would improve pregnancy rates (PR). Lactating Holstein cows between 55 and 70 DIM were used to evaluate the ML test and PR after OVSYNCH when initiated on the basis of the test result. PG+OV cows (n=60) were treated with 500 μ g cloprostenol (PG) and had one teat cannulated to test for ML. Cows with ML were started on OVSYNCH 10 days later, and those without started 3 days later. Cows in the SA+OV group (n=64) were injected with physiological saline and observed for ML. This group was started on OVSYNCH 10 days after saline. Milk samples were collected 3 times/week to determine progesterone concentrations. ML was an indicator of luteolysis with a specificity of 90% and a sensitivity of 83%. The positive and negative predictive values were 83% and 90%, respectively. Pregnancy rates were 48% for PG+OV and 52% for SA+OV ($P > 0.05$). When data from both groups were combined PR was greater in cows that started OVSYNCH in Stage 2 of the estrous cycle (day 5-9, 67%) than all other stages (Stage 1: day 1-4, 35%; Stage 3: day 10-16, 45%; Stage 4: day 17-21, 42%; $P < 0.05$). The proportion of animals with ovulation at GnRH #1, luteolysis at $PGF_{2\alpha}$, and ovulation at GnRH #2 were all greater in the PG+OV group (77% vs 55%, 85% vs 67%, and 97% vs 84%, respectively; $P < 0.05$). These data indicate that the ML test indicates luteolysis with sufficient precision to improve the response to OVSYNCH, however this did not alter PR compared to starting the protocol randomly throughout the cycle. Initiating OVSYNCH between day 5 and 9 of the cycle increased PR.

Key Words: $PGF_{2\alpha}$, GnRH, OVSYNCH

1057 Effects of experimentally-induced clinical mastitis on estrous behavior, luteal function, and establishment of pregnancy during early lactation of dairy cows. M.E. Hockett*¹, N.R. Rohrbach, R.A. Almeida, H.H. Dowlen, K. Lamar, S.P. Oliver, and F.N. Schrick, ¹*The University of Tennessee, Knoxville, Tennessee.*

The objective of the current study was to determine if experimentally induced clinical mastitis prior to ovulation resulted in altered estrous expression or decreased pregnancy rates. Estrus was synchronized in Jersey and Holstein cows during early lactation by two prostaglandin (Lutalyse, 25 mg i.m.) injections 14 d apart. Cows were inoculated with *Streptococcus uberis* in two mammary quarters 4 d prior to the second injection of prostaglandin. Control cows remained unchallenged. Cows from all groups were monitored for estrous behavior at least four times daily and artificially inseminated at estrus and 12 h later. Blood samples and rectal temperatures were obtained every 2 d for 20 d beginning immediately prior to bacterial inoculation. Sera were analyzed for concentrations of progesterone and cortisol. Pregnancy status was determined by ultrasonography 30 d following insemination. Intramammary challenge increased daily somatic cells over time following bacterial challenge in PRE cows, but not in CON cows ($P < 0.0001$). Mean rectal temperatures were also elevated in challenged cows compared to CON (39.2 ± 0.4 vs. 38.0 ± 0.4 °C, respectively; $P = 0.04$). Fewer cows with mastitis infections during the preovulatory period exhibited signs of estrus behavior (12.5 vs. 66.7%; $P < 0.02$). Days until estrus were increased in mastitis cows (27.1 ± 5.2 vs. 7.0 ± 4.4 d; $P < 0.06$) compared to controls. Concentrations of cortisol were higher ($P = 0.01$) following bacterial challenge compared to unchallenged control animals. Pregnancy rate did not differ on first service opportunity; however, first service opportunity occurred 20 d later in mastitis cows. These results suggest that clinical mastitis prior to onset of estrus interfered with expression of estrus, which would result in increased days to first service and increased days open.

Key Words: estrus, mastitis, pregnancy

1058 Supplementing transition cows with organic trace minerals or calcium propionate-propylene glycol drenching: Implications for reproductive performance. D. Monardes^{*1}, A. R. Melton², I. D. Peeler², J. H. Bame², O. A. Peralta², W. S. Swecker², R. L. Nebel², and D. J. Tomlinson³, ¹University of Chile, Santiago, ²Virginia Polytechnic Institute and State University, Blacksburg, ³Zinpro Corp., Eden Prairie, MN.

Requirements of trace elements and vitamins for optimal reproductive performance have not been well characterized. Additionally, fertility is influenced by the number of estrous cycles that occur between parturition and first insemination. The objective of this study was to evaluate milk yield, days to first ovulation, days to first expressed estrus and possible metabolic responses to the administration of a mixture of calcium propionate, propylene glycol and mineral salts at calving and 30 days after calving, in contrast to the administration of a mineral supplement 4-PLEX (Zinpro Corp.) daily from calving until 60 days post partum. Cows ($n = 54$) were assigned randomly by calving date and parity. The control group (C) received 3 liters of a saline solution at calving. The drenched group (D) received 3 liters of a mixture of calcium propionate, propylene glycol, water and mineral salts at calving and 30 DIM. The daily supplemented group (4P) received one gel cap bolus containing 14 grams of 4-PLEX from calving until 60 DIM. Milk samples were taken 3 times weekly (Monday, Wednesday and Saturday) to measure the progesterone levels in milk (mP4) as a monitor of ovarian activity. A HeatWatch[®] transmitter (DDx Inc., Denver, CO) was applied by 10 DIM to monitor standing behavior associated with estrus. Days to initial mP4 rise (30.2, 32.6 and 31.1 d for C, D, and 4P) and first standing activity (47.4, 47.1 and 53.5 d for C, D, and 4P) were not different between groups. Number of standing events and duration of estrus did not differ between groups but did increase from the first estrus, 2.7 mounts during 2:25 h, to 4.1 mounts during 4:08 h for the second estrus. Milk yield was also not influenced by either mineral supplementation or drenching with a mixture of calcium propionate, propylene glycol and mineral salts.

Key Words: Ovarian activity, Trace minerals, Dairy cattle

1059 Effects of experimentally-induced clinical mastitis during the preovulatory period on endocrine function, follicular growth and ovulation in lactating dairy cows. M.E. Hockett^{*1}, N.R. Rohrbach, R.A. Almeida, S.P. Oliver, and F.N. Schrick, ¹The University of Tennessee, Knoxville, Tennessee.

The objective of the study was to determine if experimentally-induced clinical mastitis prior to ovulation altered endocrine function, follicular growth, and ovulation. On day 8 of a synchronized estrous cycle, primiparous and multiparous Jersey cows (days 60 to 90 in milk) were challenged with *Streptococcus uberis*. Prostaglandin (PG; Lutalyse, 25mg i.m.) was administered 4 d postchallenge. Forty-eight h after PG injection, blood samples were collected every 15 min for 8 h to determine LH pulse frequency and collection continued every 2 h until ovulation to determine cortisol, estradiol-17 β , and presence of LH surge. Ovaries were scanned by ultrasonography every 6 h to monitor ovulation. Cows developing clinical mastitis ($n = 12$) had elevated rectal temperatures, somatic cell counts, and mammary scores vs controls ($n = 12$; $P < 0.05$). Due to differences in expression of estrus, cows were subdivided into 4 groups: control, TRT-EST (infected cows that displayed estrus; $n = 4$), TRT-NOEST (infected cows that did not display estrus; $n = 8$), and NOMAS (cows that were inoculated with bacteria but did not develop mastitis; $n = 4$). Ovulation rate was higher for CON (100%), NOMAS (100%) and TRT-EST (100%) than for TRT-NOEST (0%) cows ($P < 0.0001$). Control, TRT-EST and NOMAS cows required similar time from PG to estrus and ovulation. Size of the ovulatory follicle (presumed ovulatory follicle in TRT-NOEST) was similar at ovulation for all groups (for TRT-NOEST mean time of ovulation for all other groups was used). Maximum concentrations of LH and LH pulse frequency were higher for CON, TRT-EST, and NOMAS compared to TRT-NOEST ($P = 0.0017$ and $P = 0.0011$, respectively). Concentrations of estradiol-17 β increased over time in CON, NOMAS, and TRT-EST cows, but did not increase in TRT-NOEST ($P < 0.0001$). Clinical mastitis before estrus may result in reduced reproductive performance by inhibition of estrous expression and ovulation through alterations in the hypothalamo-pituitary-ovarian axis.

Key Words: estradiol-17 β , luteinizing hormone, mastitis

1060 Effect of bST and reproductive management on reproductive and lactational performance of Holstein cows. J.E.P. Santos^{*1}, S.O. Juchem¹, R.L.A. Cerri¹, C. Dei², W.W. Thatcher³, and C. Bilby², ¹University of California Davis, ²Monsanto Company, ³University of Florida.

Holstein cows, 800, were blocked according to parity and milk production and randomly assigned to one of four treatments in a 2x2 factorial design at 37 \pm 3 DIM. Treatments consisted of either bST (B; 500 mg/14 d; Monsanto Co.) starting at 63 \pm 3 DIM or no bST (C), with cows submitted to insemination after either a timed artificial insemination (TAI) protocol or estrus detection (ED). Cows received two injections of PGF2a (Lutalyse, Pharmacia & Upjohn Co.) at 37 \pm 3 and 51 \pm 3 DIM. At 63 \pm 3 DIM, cows received an injection of GnRH (Factrel, Fort Dodge Inc.), followed 7 d later by PGF2a. Cows in the ED groups were inseminated after observed in estrus during the 7 d following the last PGF2a. Cows in the TAI treatments received a second GnRH injection 48 h after the last PGF2a and were inseminated 12 to 18 h later. Pregnancy was diagnosed by ultrasound at 303 d after AI and reconfirmed 14 d later by rectal palpation. Cocygeal blood was collected for progesterone analysis at the moment of the second PGF2a, first GnRH, and 48 h after the third PGF2a injections. Lactation performance was followed for the first 13510 DIM. Body condition was scored at 37 \pm 3, 73 \pm 3, and 103 \pm 3 DIM. Continuous and binomial data were analyzed using the PROC MIXED and the LOGISTIC procedures of SAS, respectively. Preliminary data from 249 cows are presented. Treatment with bST increased yields (kg/d) of milk (44.8 vs 41.1; $P < 0.05$) and tended to increase yields of 3.5% FCM (44.6 vs 41.1, $P < 0.06$), fat (1.55 vs 1.44; $P < 0.08$), and true protein (1.28 vs 1.19; $P < 0.10$) during the first 135 DIM. Estrus detection rate for cows in the ED groups was similar for B and C cows (88.1 vs 87.2%; $P < 0.98$). Body condition score was similar for B and C cows (3.22 vs 3.21; $P < 0.84$). Conception rate at d 30 after AI was, respectively, 58.1, 46.7, 45.9, and 40.6% for EDB, EDC, TAIB, and TAIC, and it tended to be higher for EDB than TAIC ($P < 0.07$). Pregnancy rate at d 30 after AI was 43.9, 35.0, 45.9, and 40.6%, for EDB, EDC, TAIB, and TAIC, respectively; and pregnancy loss from d 30 to 44 after AI was 9.5, 16.7, 15.0, and 22.2% for EDB, EDC, TAIB, and TAIC, respectively.

Key Words: Bovine somatotropin, Reproductive management, Milk production

1061 Effect of resynchronization with GnRH on day 21 after artificial insemination on conception rate and pregnancy loss in lactating dairy cows. R.C. Chebel^{*1}, J.E.P. Santos¹, S.O. Juchem¹, R.L.A. Cerri¹, K.N. Galvao¹, and W.W. Thatcher², ¹University of California Davis, ²University of Florida.

Holstein cows on two commercial dairy farms were artificially inseminated 21 d prior to the date of enrollment in the study. Cows (585) were assigned to one of two treatments in a randomized complete block design. At the beginning of the study, DIM, milk and BCS were all similar between treatments ($P > 0.15$). At dairy 2 all cows received bST every 14 d, starting at 655 DIM. Treatments consisted of either resynchronization (RES) with an injection of 100 ug of GnRH (Merial Ltd.) or no treatment (Control, CON) on d 21 after AI (study day 0). On study day 7 pregnancy was diagnosed by ultrasonography and reconfirmed 14 d later by palpation. Cows diagnosed as non-pregnant at study day 7 in the RES and CON groups received an injection of PGF2a (Pharmacia & Upjohn Co.) or GnRH, respectively. The Ovsynch protocol was then finalized in both treatment groups. Ultrasonography of the ovaries was performed at study days 0 and 7. A cocygeal blood sample was collected at the moment of enrolment in the study for measurements of plasma progesterone, and BCS was taken at the same time. Plasma progesterone above 2.3 ng/ml was indicative of pregnancy at d 21. Continuous and binomial data were analyzed by the GLM and LOGISTIC procedures of SAS, respectively. First service conception for RES and CON was similar at d 28 (33.1 vs 33.6%, $P < 0.80$) and 42 (27.0 vs 26.8%; $P < 0.98$) after the initial AI. Progesterone concentration on d 21 affected conception rate at d 28 ($P < 0.0001$). Plasma progesterone on d 21 in cows classified pregnant was higher for cows that maintained pregnancy from d 21 to d 28 (11.9 vs 10.7 ng/ml; $P < 0.03$) and to d 42 (11.9 vs 10.9 ng/ml; $P < 0.07$). Pregnancy loss from d 28 to 42 averaged 17.0% and it was similar for RES and CON ($P < 0.74$). Conception rates in the subsequent AI were 28.0% and 26.5% for RES and CON ($P < 0.77$). Pre-treatment with GnRH at day 21 after AI did not affect conception rates to either first service or the re-synchronized

second service. Use of GnRH for resynchronization of open cows prior to pregnancy diagnosis permits an earlier programmed re-insemination of open cows.

Key Words: Reproduction, Pregnancy loss, GnRH

1062 Path analysis of metabolic and endocrine risk factors for repeat breeder cows. N. Moss^{1,2}, I.J. Lean^{*1,2}, S.W.J. Reid³, and D.R.H. Hodgson², ¹*Bovine Research Australasia*, ²*University Of Sydney*, ³*University of Glasgow*.

We investigated interactions between metabolic and endocrine factors at first insemination and conception requiring > 1 (CONC>1) and > 2 insemination (CONC>2) in a prospective cohort study. Holstein cows (n=709:224 primiparous; 485 multiparous) from 7 non-seasonal calving herds in NSW and 3 seasonal calving herds in Victoria, Australia were used. Herds were principally pasture-fed, supplemented with concentrates and conserved forages. Mean milk production at first service was 30.5 L (inter-herd range 24.5-36.5 L). Biographic and disease data were collected. Cows were body condition scored within 10 days before calving and again at first insemination. Cows were blood sampled at first insemination. Serum albumin, total protein, calcium, phosphorus, urea, NEFA, cholesterol and BOHB and plasma concentrations of glucose, progesterone and LH were determined. Pregnancy was determined 45-75 days after last insemination.

Path analysis was used to determine relationships between explanatory variables and CONC>2. Much of the variability in CONC>2 was explained by CONC>1. Other key pathways (all P<0.1) included: i) CONC>2 in the previous lactation, through extended dry periods (odds ratio (OR)= 9.35), and CONC>1 (OR=2.27); ii) CONC>2 in the previous lactation resulting in higher BCS at calving ($\beta=0.15$) leading to increased BCS loss between calving and first insemination ($\beta=0.84$), lower blood albumin (OR=1.53) and higher BOHB, through lower blood glucose (OR=0.46) at first service, and CONC>1 (OR=1.16); iii) Parity>5 leading to low BCS at first service (OR=3.39) resulting in low serum cholesterol (OR=2.15) and CONC>1 (OR=1.61); iv) Periparturient disease increasing BOHB ($\beta=0.67$) and risk of low albumin (OR=1.62) at first service, both increasing milk fat:protein at first service ($\beta=0.22$, $\beta=0.50$) which in turn directly increased risk of CONC>2 (OR=1.07). Of the final model, 43% of the explained variability in CONC>1 was accounted for by metabolites that reflect negative nutrient balance.

Key Words: Repeat Breeder, Path Analysis, Nutrition

1063 Comparison of Ovsynch vs estrous detection in anovulatory and ovulatory lactating dairy cows. A. Guemen*, J. N. Guenther, and M. C. Wiltbank, *Department of Dairy Science, University of Wisconsin-Madison*.

Transrectal ultrasonography was used to determine the percentage of anovulatory cows and the maximal size of anovulatory follicles in lactating dairy cows (n = 316) in a commercial dairy. Ovaries were evaluated at 47-53 d postpartum (pp) and again 7 d (54-60d pp) later. A total of 20.2% (64 of 316) of cows were anovulatory with no detectable luteal tissue by ultrasonography or circulating progesterone. A greater (P<0.01) percentage of primiparous cows were anovulatory than multiparous cows (28% vs. 15%, respectively). Most (78%) anovulatory cows had large follicles (> 15 mm diameter) with 22% having smaller follicles (9-14 mm). Only 20% of anovulatory cows would be considered cystic (follicles > 25 mm) with most (58%) anovulatory cows having follicles larger than normal ovulatory size but not cystic (15-25 mm). In the second part of this study ovulatory and anovulatory cows were randomly assigned to be bred by normal detection of estrus (visual detection and Kamar device) during the next 21 days or to receive the Ovsynch protocol (GnRH-7d- PGF-2d-GnRH) and timed AI (16-18 h after 2nd GnRH). Cows had ovaries scanned weekly during the 21 d time period to detect ovulations. Of the anovulatory cows receiving Ovsynch, 88% (29/33) ovulated to the first GnRH and 94% (31/33) ovulated to the second GnRH as compared to 42% (13 of 31) spontaneous ovulation of anovulatory cows assigned to the estrous detection group. Conception rate (CR) was similar in the Ovsynch and estrous detection groups for ovulatory (37% [43/117], 39% [38/97] respectively) or anovulatory cows (10% [3/30], 22% [2/9] respectively). Pregnancy rate also was not different for Ovsynch and estrous detection groups for ovulatory (37% [43/117], 28% [38/135] respectively) and anovulatory cows (10% [3/30], 6% [2/31] respectively). Thus, 20% of lactating dairy cows were not cycling at 60 d pp with most having follicles larger than ovulatory size

but generally not cystic size. Most (94%) of these anovulatory cows ovulated following Ovsynch but had lower CR than ovulatory cows.

Key Words: Avovulatory, Ovsynch, Dairy cows

1064 Estradiol cypionate in postpartum dairy cattle: effect on reproduction and milk production. J. M. Haughian*, R. Sartori, A. Gümen, J. N. Guenther, and M. C. Wiltbank, *University of Wisconsin, Madison*.

Estradiol cypionate (ECP) is a long-acting estradiol-17 β commonly used as a uterine evacuant to treat calving-related uterine disorders in lactating dairy cattle. There is evidence to suggest that ECP treatment may inhibit postpartum (PP) follicle development and delay the time to first ovulation. This trial, conducted on a 1200-cow commercial dairy, was designed to evaluate the effect of administering ECP in the early PP period on cycling status (cycling or anovulatory) at 30 to 40 d PP, reproductive efficiency, and milk production in lactating dairy cattle. Lactating Holstein cows were divided by parity, primiparous (n = 159) and multiparous (n = 97); then randomized for treatment with 0, 4, or 10 mg of ECP on d 5 to 8 PP. Cycling status was determined by two ultrasound examinations, the first at 30 to 33 d PP and the second 7 d later. Individual reproduction records and daily milk yield values from 10 to 90 d PP were also analyzed. Treatment with ECP had no effect on the percentage of anovulatory primiparous cows (18.3% overall) at 40 d PP; however, a greater percentage of multiparous cows treated with 10 mg of ECP were anovulatory (48%) at 40 d PP compared to cows treated with 0 mg (13%) and 4 mg (26%). Days to first service and days to conception were not different amongst treatment groups. Daily milk yield for primiparous cows treated with 0 mg was 4.2% and 4.5% greater than 4 and 10 mg treatments, respectively. Multiparous cows treated with 4 mg of ECP had 10.1% and 4.3% greater milk yield compared to 0 and 10 mg treatments, respectively, and cows treated with 10 mg had 4.1% greater milk yield than 0 mg. In summary, cycling status of primiparous cows, days to first service, and days to conception were unaffected by ECP treatment; however, ECP increased the percentage of multiparous cows that were anovulatory at 40 d PP. Surprisingly, early PP treatment with ECP had a significant positive or negative effect on milk yield depending on parity of the cow receiving treatment.

Key Words: ECP, Postpartum cows, Milk yield

1065 Factors affecting the intensity and duration of estrus of Holstein and Jersey cattle. R. L. Nebel*, J. H. Bame, and R. E. Pearson, *Virginia Polytechnic Institute and State University, Blacksburg, VA/USA*.

Estrous behavior of lactating cows and heifers as measured by a radiotelemetric system (HeatWatch[®], DDx Inc., Denver, CO) was monitored over a 7 yr period (October 1994 to January 2002). The system provides 24-hour, totally automated surveillance of mounting activity. Individual characteristics associated with estrus recorded by the system were time and duration of each standing event (STD). Duration of estrus, defined as the time interval from first to last STD, and number of STD for heifers, cows, and combined were analyzed with models that included combinations of breed, parity (heifer vs. cow or 1, 2, or 3+), year, season, time of day at onset, selected interactions and regression on summit milk. Least squares means and SE are presented. Duration averaged 7.3 \pm 0.2 h for Holstein cows (n = 977), 8.9 \pm 0.3 h for Jersey cows (n = 423), 10.6 \pm 0.3 h for Holstein heifers (n = 406), 12.6 \pm 0.5 h for Jersey heifers (n = 185). Jerseys had extended estrus periods and heifers exhibited estrus approximately 40% longer than cows (P \leq 0.01). For both heifers and cows, time of day that the onset of estrus occurred influenced the duration of estrus (P \leq 0.05). STD for Jersey heifers averaged 27.4 \pm 0.9 vs. 17.0 \pm 0.6 for Holstein heifers (P \leq 0.01). For heifers, spring and fall were similar with 24 STD; whereas, winter and summer were similar with 18 STD (P \leq 0.01). Time of day of onset of estrus influenced the number of STD for heifers and ranged from 17.8 when first STD occurred between 15:00 and 18:00 to 27.2 when onset occurred between 03:00 and 06:00 (P \leq 0.01). Summit milk yield was inversely related to STD (P \leq 0.01). Season and occurrence of the onset of activity did not affect STD for cows. STD per estrus ranged from 32.7 \pm 1.2 for Jersey heifers during the fall season to 5.7 \pm 0.8 for Holstein cows during the summer. Seasonal effect on STD were revealed

for heifers but not for cows and was probably due to our ability to keep cows cool and experiencing less heat stress during the summer.

Key Words: Dairy cattle, Estrous behavior, Radiotelemetry

1066 Synchronization of estrus in dairy heifers using GnRH, PGF_{2α} and ECP. H. Rivera* and P.M. Fricke, *University of Wisconsin-Madison.*

In a preliminary trial, cycling Holstein heifers (n=12) received GnRH (100 μg) at a random stage of the estrous cycle followed by PGF_{2α} (PGF; 25 mg) 6 d later. Proportion of heifers in estrus by 24, 48, 72, and 96 h after PGF was 2/12, 2/12, 6/12, and 1/12, respectively, with one heifer not displaying estrus. To assess the effect of ECP on timing of estrus and ovulation, cycling Holstein heifers (n=24) were randomly assigned to receive either GnRH (100 μg) at a random stage of the estrous cycle followed by PGF (25 mg) 6 d later (GP) or GnRH and PGF as per GP heifers with the addition of estradiol cypionate (ECP; 0.5 mg) 24 h after PGF (GPE). Timing of estrus was assessed using Kamar devices, and timing of ovulation was assessed by ultrasound examinations conducted every 6 h after Kamar activation. Overall, 50.0% (12/24) of heifers ovulated within 48 h after GnRH. Follicle diameter at GnRH was greater (p<0.01) for ovulatory vs. nonovulatory follicles (11.9 ± 0.5 vs. 7.6 ± 0.8 mm), and 4 nonovulatory heifers displayed estrus after GnRH but before PGF. Based on serum progesterone, 83.3% (20/24) of heifers had a functional CL at PGF; 90.0% (18/20) of functional CL regressed and 16.7% (2/12) of GnRH-induced CL failed to regress. Overall, 66.7% (16/24) of heifers displayed estrus within 3 d after PGF, and interval from PGF to estrus (47.3 ± 2.6 vs. 51.0 ± 2.8 h) and ovulation (76.5 ± 2.7 vs. 84.0 ± 4.4 h) did not differ between GP and GPE heifers, respectively. Although diameter of ovulatory follicles at PGF did not differ between treatments (10.7 ± 0.6 vs. 9.9 ± 0.9 mm for GP vs. GPE, respectively), diameter of ovulatory follicles 6 h before ovulation tended to be greater (p=0.06) for GP (13.7 ± 0.5 mm) than for GPE (12.1 ± 0.7 mm) heifers. Diameter of ovulatory follicles at PGF was negatively correlated (p<0.01) with time from PGF to ovulation (r = -0.72). Characterization of follicular and luteal responses and timing of estrus and ovulation after GnRH and PGF will support development of a fixed-time AI protocol for dairy heifers. *Supported by Hatch project WIS04431.*

Key Words: Dairy Heifers, Synchronization of estrus

1067 Pregnancy rates to a timed insemination protocol using estradiol cypionate or GnRH in Holstein heifers and cows. J.D. Ambrose*¹, J.P. Kastelic², and R. Rajamahendran³, ¹*Alberta Agriculture Food and Rural Development, Edmonton*, ²*Agriculture Agri-Food Canada, Lethbridge*, ³*University of British Columbia, Vancouver, Canada.*

Three experiments were conducted using estradiol cypionate (ECP) and GnRH for synchronizing ovulation. In Experiment I, 19 pubertal heifers received (Day 0 of the experiment) an intravaginal CIDR-device and im injections of: 1) 0.5 mg ECP (n=6); 2) 100μg GnRH (Fertiline, n=6); or 3) 2 mL saline (n=7). All heifers received 25 mg PGF_{2α} (Lutalyse) im on Day 7 and the CIDR was removed on Day 8. Heifers given ECP on Day 0 received a second injection (0.5 mg) at CIDR-removal; those given GnRH or saline received their respective second injections on Day 9. Interval to establishment of a dominant follicle (6.3, 5.2, 5.7 d), its maximum diameter (13.9, 13.9, 15.3 mm), synchronized ovulation rate (100, 100, 86%), and mean interval from CIDR removal to ovulation (66, 56, 70 h; range 48-84, 48-60, 60-72) were not significantly different among ECP, GnRH and saline groups, respectively. Mean interval to the LH peak (after the second injection of ECP, GnRH or saline) was 38.1, 1.6 and 20.0 h (p<0.01) and peak LH concentrations were 9.3, 11.3 and 10.3 ng/mL (p>0.05). In Experiment II, pubertal heifers were given a CIDR and randomly assigned to receive ECP (n=53) or GnRH (n=59) treatments as in Experiment I. Timed-AI was done 44 or 16 h after the second injection of ECP or GnRH, and pregnancy rates (32 d) were 66.0 and 61.0%, respectively. In Experiment III, lactating cows (n=112) were given 100μg GnRH (Day 0), 500 μg cloprostenol (Estrumate, Day 7) and were alternately allocated to receive either 1 mg ECP on Day 8 (and AI 44 h later) or 100μg GnRH on Day 9 (and AI 16 h later). Pregnancy rates (40 d) were 23.5 and 33.3%, respectively (p>0.25). In conclusion, in CIDR-based protocols in heifers, ECP and GnRH effectively synchronized wave emergence and ovulation and resulted in acceptable fertility. However, substitution of ECP for the second GnRH in

an Ovsynch/timed-A.I. program in cows resulted in numerically lower pregnancy rates.

Key Words: ECP, CIDR, Timed Insemination

1068 Induction of a new follicular wave in holstein heifers synchronized with norgestomet. F.E.O. Garcia*^{1,2}, M.J.L. Cordero¹, E.A. Hizarza¹, O.J.G. Peralta¹, C.M.E. Ortega¹, M. Cardenas⁴, C. G. Gutierrez³, and T.E.M.T. Sanchez¹, ¹*Colegio de Postgraduados*, ²*Universidad de Guadalajara*, ³*Universidad Nacional Autonoma de Mexico*, ⁴*Instituto Nacional de la Nutricion, Salvador Zubiran.*

In order to synchronize estrous cycle in bovine, progestin has been used at common doses, however in the absence of a corpus luteum this practice cause persistence of the dominant follicle and a decrease in fertility of the synchronized estrus. Our objectives were to induce a new follicular wave in heifers synchronized with norgestomet. Thirty Holstein heifers, presynchronized with two doses of PGF_{2α} im. 11 days apart, six days after estrus (day 0=estrus) received a norgestomet implant (SMB, 6 mg) and 25 mg of PGF_{2α} im. On day 12, heifers were randomly assigned to 5 treatments (n=6): T1 received a second norgestomet implant; T2, heifers received 100 mcg of GnRH im; T3, 200 mg of progesterone im; T4, saline and in T5 heifers received 100 mcg of GnRH on day 9, and implant removal on day 16 plus 25 mg of PGF_{2α} im. Ultrasound examination and blood samples were collected every 48 h from day 3 to 11 and every 24 h from day 11 to 21. Induction of a new follicular wave succeeded in 6/6, 0/6, 6/6, 6/6 and 6/6 in T1, T2, T3, T4 and T5, respectively. Ovulation occurred at 54.0 and 110.5 h, day of ovulation was 3.05 and 5.42 d after implant removal and the size of the ovulated follicle was 20.03 ± 2.03 and 16.13 ± 1.78 mm for heifers that developed a persistent follicle or a follicle from a new wave, independent from treatment (P<0.05). Progesterone concentration was <1 ng/ml during the treatment period in T1, T2, T3 and T4 and in T5 was >1 ng/ml on days 15 and 16. In T5 a new follicular wave, with signs of estrus and ovulation was induced in all heifers (6/6).

Key Words: Estrous Synchronization, Persistent Follicle, Progestin

1069 Effect of sodium azide and glucose on post-compaction development of in vitro produced bovine embryos. J. F. De La Torre-Sanchez* and G. E. Seidel Jr., *Colorado State University, Fort Collins, Colorado.*

When oxidative phosphorylation is partially down-regulated with sodium azide (NaN₃), an inhibitor of cytochrome oxidase a₃, there is a beneficial effect on in vitro development of bovine embryos. Our aim was to evaluate effects of various levels of NaN₃ at different glucose concentrations on post-compaction development of in vitro cultured bovine embryos. Abattoir oocytes were matured in TCM-199 and fertilized in a chemically defined medium with nonessential amino acids, 0.5% FAF BSA and heparin (CDM) in 0.5 ml wells at 39C in 5% CO₂ in air. After fertilization, presumptive embryos were placed in culture in CDM for 2 d and then in CDM plus essential amino acids (CDM-2) for 2 more d, all in 5% CO₂/5% O₂/90% N₂. Compact morulae then were selected (n=1440) and randomly allocated (10 per subclass) to 16 treatments (0, 3, 9 and 27 μM NaN₃ x 0, 0.5, 2 and 8 μM glucose) for an additional 72 h in CDM-2; the experiment was replicated 3 times with semen from each of 3 bulls. Evaluations were performed at 36 and 72 h for % blastocysts, stage of development, morphological quality (scale of 1 to 4), degree of lightness as a measure of lipids (subjective scale of 1 to 5) and quality of the inner cell mass (scale of 1 to 4). Embryos then were fixed and stained to count cells. Wells were coded to make evaluations blind. Data were analyzed by factorial ANOVA, with factors NaN₃ (4), Glucose (4) and bulls (3). Embryos exposed to the highest dose of NaN₃ were brighter at 72 h (P<0.01) than embryos exposed to lower or no NaN₃. An interaction between NaN₃ and glucose for stage of development and quality at 36 h (P<0.05) was also observed; except for embryos in 3 μM NaN₃, all NaN₃ levels produced more advanced and better quality embryos when cultured in 2 μM, but not other levels of glucose. NaN₃ improved post-compaction development of in vitro produced embryos, especially with 2 μM glucose.

Key Words: Embryo, Glucose, Sodium azide

1070 Dynamic changes in body composition quality traits as influenced by sampling interval and handling in beef heifers. H. L. Evans^{*1}, S. T. Willard², R. King³, and R. C. Vann¹, ¹*Brown Loam Branch Experiment Station, Mississippi State University*, ²*Designer Genes Technologies, Inc.*

Age and weight are common criteria used to estimate onset of puberty in beef heifers, secondary metabolic characteristics, such as repartitioning of fat, may also influence reproduction in relation to stress and handling. The objective of this study was to determine whether fluctuations in percent intramuscular fat (%IMF) might be influenced by stress of handling and hormonal changes that occur during the estrous cycle in beef heifers. Crossbred beef heifers (n=26) were randomly assigned to two treatment groups; Intensive sampling (3X weekly; n=14) and Weekly sampling (1X; n=12). On D 0, cattle were weighed, assessed a reproductive tract and a body condition score, hip height measured, blood samples collected and all animals administered PGF2a (25mg i.m.; Pharmacia Upjohn). Sampling measurements consisted of real-time ultrasound for %IMF of the Longissimus muscle at the 11, 12 and 13th ribs, longissimus area, back fat thickness, rump fat thickness and gluteus medius depth using a 3.5 MHz 172mm transducer and Aloka 500V Ultrasound System. Carcass quality trait analysis and blood sampling were conducted from d 0 through d 28 post-PGF2a. Serum concentrations of progesterone (P₄) were determined by radioimmunoassay. Serum P₄ (P<0.05) profiles resembled those of normal estrous cycles and were consistent with heat detection data for both groups. Sampling treatment intervals did not contribute to fluctuations in %IMF or P₄ concentrations. Correlation of %IMF and stress score, a determination of IMF consistency, described a negative relationship (-0.63 to -0.38; P<0.06); thus as the stress score increased the consistency and percentage of IMF decreased. These data suggest no direct relationship between serum concentrations of P₄ (i.e., stage of estrous cycle) and %IMF. Stress of handling and sampling treatment intervals resulted in minimal impact on hormonal and %IMF fluctuations.

Key Words: IMF, Beef Heifers, progesterone

1071 Use of melengestrol acetate for estrus synchronization in an artificial insemination program in ewe. F.W. Castonguay^{*1,2}, G. Leduc², and F. Goulet^{1,2}, ¹*Agriculture and Agri-Food Canada, Lennoxville, Quebec, Canada*, ²*Depart. Sciences animales, Université Laval, Quebec, Québec, Canada*.

The objective of this study was to evaluate the potential of melengestrol acetate (MGA), an orally active progestagen, for estrus synchronization in an artificial insemination (AI) program. Two experiments were conducted in anoestrous season (May) to 1) determine the time of the LH peak in ewes synchronized with MGA and 2) evaluate the fertility rate of the ewes inseminated following estrus synchronization with MGA. In the first experiment, a total of 24 Canadian Arcott ewes received a daily oral dose of 0.25 mg/hd or 0.40 mg/hd of MGA for 12 d. Blood samples were collected every 4 h from 36 h to 96 h after the last feeding of MGA. Serum samples were analyzed for LH by radioimmunoassay. Three ewes did not show a LH peak during the sampling period. The mean interval between the last dose of MGA and LH peak was not different for the ewes treated with 0.25 (60.0±13.6 h) or 0.40 mg/hd/d (64.0±12.6 h) of MGA. The time of onset of the LH peaks varied from 44 h to 84 h. This information was used to determine the insemination time for experiment 2. In the second experiment, 81 Dorset ewes were assigned to one of three synchronization treatments: T1) vaginal progestagen sponge for 14 d + 500 I.U. PMSG at sponge withdrawal (control group, n=21); T2) 0.25 mg/hd/d MGA for 12 d + 500 I.U. PMSG 12 h after the last feeding of MGA (n=20); T3) 0.25 mg/hd/d MGA for 12 d + 500 I.U. PMSG 12 h after cessation of MGA feeding followed by 50 ug GnRH 60 h after the last dose of MGA (n=40). Ewes were inseminated with fresh semen 55 h after removal of the vaginal sponge (T1) or 76 h after the last feeding of MGA for T2 and T3. Lambing rate to timed AI were not different between the three treatment groups (42.9, 45.0 and 45.0% for T1, T2 and T3, respectively). In conclusion, MGA could replace the traditional vaginal sponge treatment for estrus synchronization in AI program in sheep.

Key Words: Ewe, Insemination, MGA

1072 Synchronization of estrus with SucroMate-D bovine and prostaglandin F2α in beef heifers. P. Ryan^{*1}, S. Willard¹, B. Gandy¹, S. Bowers¹, P. Burns², and B. Simon², ¹*Mississippi State University, Mississippi State, MS*, ²*Thorn BioScience Inc., Lexington, KY*.

SucroMate-D Bovine (SMD) is a parenteral formulation of deslorelin acetate designed to synchronize estrus in beef cattle when administered 7 d prior to administration of PGF2α (PG). The objective of this study was to determine the interval to estrus among beef heifers given 1 mL of SMD (50 µg/mL deslorelin acetate im) at 7 d before administration of Lutalyse (25 mg Dinoprost im) for comparison with controls given SMD vehicle and PG. Beginning at random stages of the estrous cycle, 76 heifers (Hereford, Angus and Charolais; weight >340 kg; age 14-16 mo.; and uterine score 3+ on a scale of 1-5) were assigned at random to be given SMD + PG 7 d later (n = 38) or SMD vehicle + PG 7 d later (n = 38). Daily observations for estrus beginning 30 days prior to treatment were supplemented using HeatWatch[®]. Fifty-two heifers had shown estrus before treatments commenced, while six showed no signs of estrus throughout the trial. Heifers were artificially inseminated (AI) after estrous detection using the am/pm rule. Heifers returning to estrus were inseminated again. Pregnancy diagnoses were made on d 35 and confirmed on d 55 after the first AI using transrectal ultrasonography. Twenty-nine heifers (76%) given SMD and 17 (45%) controls showed estrus within 72-h after PG (P < 0.05). These heifers had a first service conception rate of 76% and 69%, respectively (P > 0.10), and a pregnancy rate of 58% and 29%, respectively (P < 0.01). For the 30-day interval post-PG, the estrous detection rate, first service conception and pregnancy rates were 84%, 81% and 71% for SMD treated heifers and 87% (P > 0.10), 68% (P < 0.05) and 61% (P > 0.10) for controls, respectively. Efficiency of estrous detection by visual observation and HeatWatch[®] did not differ (P > 0.10). We conclude that, by comparison with PG controls, SMD + PG enhanced the synchrony of estrus and increased the pregnancy rate of beef heifers inseminated during a 72-h period after PG.

Key Words: Estrus synchronization, Beef heifers, Deslorelin acetate

1073 Induced twinning in postpartum suckled beef cows using artificial insemination and embryo transfer. G. C. Lamb¹, D. R. Brown¹, C. R. Dahlen^{*1}, and A. R. Spell², ¹*University of Minnesota, Grand Rapids, MN*, ²*Cyagra LLC., Manhattan, KS*.

The objectives of this experiment were to determine whether transferring an embryo into a cow after timed insemination would increase fertility and twinning rates. One hundred and forty four suckled beef cows were fed MGA (0.5 mg/head/d) for 7 d with a 25 mg injection of PGF on the last day of MGA (d -11). Cows received an injection of GnRH 4 d after PGF (d -7) and a second injection of PGF 11 d after the last day of MGA (d 0). Forty-eight hours later (d +2) all cows received a second injection of GnRH and were assigned randomly to three treatments: 1) on d +2 cows received one fixed time AI (AI; n = 48); 2) on d +9 cows received a direct transfer embryo placed in the uterine horn ipsilateral to the ovary containing a CL (TWIN; n = 48); and, 3) cows received a fixed-time insemination on d +2 and an embryo on d +9 (ET; n = 48). Ultrasonography was used to monitor follicle diameter on d +2, CL diameter on d +9 and to determine the presence of an embryo at 30 to 35 d after insemination. Pregnancy rates were greater (P < 0.05) for TWIN (54%) and AI (48%) than for ET (27%) treated cows. Of the 26 pregnant cows in the TWIN treatment 4 were twin pregnancies, whereas there were no twin pregnancies in either the AI or ET treatment. As a result, TWIN cows (64%) had more (P < 0.05) fetuses as a percentage of all treated cows than AI (48%) or ET (27%) treated cows. Pregnancy rates were greater (P < 0.05) in primiparous (56%) than multiparous cows (38%), but days postpartum on d 0 also were greater (P < 0.01) for primiparous (83 d) than multiparous (67 d) cows. Days postpartum was not correlated to CL or follicle size but was correlated (P < 0.01) to overall pregnancy rates (0.22). Corpus luteum diameter determined by ultrasound was correlated (P < 0.01) to CL score (-0.24); however, CL score was not correlated to embryo transfer pregnancy rates. We conclude that transferring an embryo into a cow after timed-AI increased twinning rates and overall pregnancy rates.

Key Words: Twinning, Artificial Insemination, Embryo Transfer

1074 Effects of calf removal on the diameter of the dominant follicles and on ovulation rates at GnRH and Estradiol Benzoate injections in anestrous Nelore cows. J.L.M. Vasconcelos*, E.R. Vilela, A.H. Souza, M. Meneghetti, and N. Ferreira Jr., *FMVZ-UNESP, Botucatu, SP, Brazil.*

This study was designed to evaluate whether CR (48h) prior to GnRH (100mcg) and/or after PGF₂α (25mg) injections in a protocol for synchronization of ovulation (GnRH-7 days-PGF₂α-24h-EB-24h-AI) results in larger dominant follicles (DF) and improves ovulation rates at GnRH and EB (1mg) injections. Cows were considered anestrous (n=99) if progesterone (P₄) was under 1.5ng/ml at 10d before and at the time of GnRH and suffered or not CR before GnRH and between PGF₂α and AI, in a 2 x 2 factorial. Ovarian morphology was evaluated by ultrasound to determine diameter of the DF and ovulation rates to GnRH and EB. Data were analyzed by logistic regression and ANOVA in SAS. Size of DF at day of GnRH injection was influenced (P<0.05) by CR and BCS (scale 1 to 5) and was 10.5±0.2mm (n=48) and 9.9±0.2mm (n=51) in cows with and without CR, and 9.8±0.3mm (n=37) and 10.5±0.2mm (n=62) in cows with BCS ≤3 or >3. More cows with CR before GnRH ovulated (P<0.01; 83%) when compared with cows without CR (48%). Size of DF in cows that ovulated at GnRH was larger (P<0.05) than cows that did not ovulate (n=66; 10.6±0.2mm vs. 9.6±0.3mm, n=33). Size of DF at time of AI was influenced (P<0.01) by ovulation to GnRH and was 10.8±0.2mm (n=66) or 9.8±0.3mm (n=33) in cows with and without ovulation to GnRH, and by BCS (P<0.05, 9.9±0.3mm, n=37 and 10.8±0.2mm, n=62) in cows with BCS ≤3 or >3. Ovulation to EB was influenced by CR (P<0.05, 77 with vs. 55% without CR), and size of DF at time of AI (P<0.01, 11.1±0.1mm, n=68 and 9.5±0.4mm, n=31) in ovulating and non ovulating cows. Interestingly, BCS did not influence ovulation to GnRH (P>0.10, 59 vs. 73%), but influenced ovulation to EB (P<0.05, 55 vs. 77%) in cows with BCS ≤3 or >3, respectively. These data show that CR is an important tool that may be applied to increase ovulation rates in TAI protocol in anestrous Nelore cows through increases in size and persistence of the DF. In lower BCS (≤3) cows, GnRH had higher efficiency than EB.

Key Words: Calf Removal, Nelore cows, Anestrous

1075 Effect of PGF₂α timing on the reproductive performance of beef cows treated with CIDR-B and estradiol benzoate. A.T. Estrada*, J. Walton, K. Bateman, and W.H. Johnson, *University of Guelph, Guelph, Ontario, Canada.*

An effective ovulation synchronization program will result in acceptable conception rates following fixed-time artificial insemination (FTAI). The objective of this study was to compare the effect of PGF₂α timing in a FTAI synchronization protocol. Crossbred beef cows (n= 154) and heifers (n= 71) were randomly assigned to one of two synchronization protocols and managed in spring and fall breeding groups. On Day 0, all animals received a CIDR-B device (Vetrepharm Canada Inc, London, ON) and 1 mg of estradiol benzoate (EB) plus 100 mg progesterone (P₄) (Veterinary Pharmacy, Guelph, ON). Treatment 1 animals received 25 mg of dinoprost (PGF₂α, Lutalyse, Pharmacia & Upjohn, Orangeville, ON) on Day 6 and Treatment 2 on Day 7. CIDR-B devices were removed from all animals on Day 7. On Day 8, all animals received 1 mg of EB, and FTAI was performed 52 hrs after CIDR-B removal. Pregnancy diagnosis was determined by ultrasonography at

day 35 after FTAI. Conception rates were analyzed by chi-square test. Conception rates for Treatment 1 in the spring breeding group were; cows 74%(31/42), heifers 48%(10/21) and in the fall breeding group; cows 73%(27/37), heifers 81%(13/16). Conception rates for Treatment 2 spring breeding group were; cows 74%(28/38), heifers 55%(11/20) and in the fall breeding group; cows 68%(25/37) and heifers 57%(8/14). The conception rate for heifers in the spring breeding group was different when compared within Treatment 1 (p<0.05). There were no significant differences among treatments and within Treatment 2. Results indicate that administering PGF₂α on Day 6 or Day 7 of the program yielded similar conception rates and are equally effective in synchronizing ovulation for fixed-time artificial insemination. Treatment 2 reduces from 5 to 4 the number of times animals need to be handled.

Key Words: CIDR-B, Fixed-time, Synchronization

1076 Induction of ovulation in dairy cattle with a deslorelin implant. JA Bartolome*¹, JEP Santos², SM Pancarci¹, P Melendez¹, ACM Arteche¹, O Hernandez¹, LF Archbald¹, TE Trigg³, and WW Thatcher¹, ¹University of Florida, Gainesville, Florida, ²University of California, Davis, California, ³Peptech Animal Health, North Ryde, Australia.

Progesterone (P₄) and estradiol influence embryo survival. Objective was to evaluate ovarian function after inducing ovulation with 450, 750 and 1000 µg of Deslorelin in nonlactating cows and heifers. Animals received GnRH (100 µg, im) on d -9, and 2 doses of PGF₂α (25 mg, im, 8 h apart) on d -2. Exp. 1: On d 0, cows (n=20) received either 100 µg (im) GnRH (Control, n=6) or Deslorelin implants (sq) of 750 (DES 750, n=7) or 1000 (DES 1000, n=7) µg. Exp. 2: On d 0, cows (n=23) received 100 µg of GnRH (Control, n=8), or a 450 µg Deslorelin implant (DES 450, n=6). In experiments 1 and 2, cows received PGF₂α on d 16. Ultrasonography and blood sampling for P₄ were used to monitor ovarian activity. Exp. 3: On d 0, heifers (n=44) received either 100 µg of GnRH (Control, n=22) or 750 µg of Deslorelin implant (DES 750, n=22). On d 16, all heifers received PGF₂α. Blood samples were collected on d 7, 13, and 16. Exp. 1: P₄ (ng/ml) from d 0 to d 16 was not different between Control (5.9 ± 0.6), DES 750 (6.4 ± 0.6), and DES 1000 (6.3 ± 0.6). P₄ was higher on d 11 for DES 1000 (11.1 ± 1.0) compared to Control (8.2 ± 1.1; P<0.05) and on d 12 for DES 750 (12.4 ± 1.0) compared to Control (9.0 ± 1.1; P<0.05). The first-wave dominant follicle (mm) was larger (P<0.02) for Control (9.48 ± 1.1) compared to DES 1000 (4.92 ± 1.0) and not different from DES 750 (7.82 ± 1.0). The largest follicle from d 16 to d 20 was greater (P<0.001) in Control (16.1 ± 0.9) compared to DES 750 (6.3 ± 0.8) and DES 1000 (4.7 ± 0.8). Exp. 2: Average P₄ did not differ between Control (5.9 ± 0.80) and DES 450 (7.4 ± 1.0). P₄ tended to be higher (P<0.10) on d 9 in DES 450 (11.4 ± 1.5 > 8.0 ± 1.2) and was higher (P<0.05) on d 10 (13.0 ± 1.5 > 8.2 ± 1.2). The first-wave dominant follicle was larger (P<0.01) for Control (11.4 ± 1.0 > 6.0 ± 1.1 mm) as was the largest follicle from d 16 to d 28 (16.5 ± 1.85 > 9.7 ± 1.85 mm; P<0.001). Deslorelin cows of experiments 1 and 2 failed to ovulate by d 28. Exp. 3: Overall P₄ tended (P<0.07) to be higher for DES 750 (12.9 ± 0.7) compared to Control (11.1 ± 0.7). In conclusion, Deslorelin implants induced ovulation, stimulated development of a normal CL, and delayed follicular growth during diestrus.

Key Words: Ovulation, GnRH agonist, Ovarian function

Ruminant Nutrition Feedlot, Transition Cow, and Silage

1077 Effect of sugar cane level on intake, digestibility, and ruminal fermentation in crossbred steers fed stargrass. E. Aranda¹, G.D. Mendoza*¹, C. Garcia-Bojalil¹, J.A. Ramos¹, F. Castrejon², and R. Rojo³, ¹Colegio de Postgraduados, Montecillo, Texcoco, Mexico, ²UNAM-FMVZ, Cd. Universitaria Mexico, D.F., Mexico, ³Universidad Autonoma de Guerrero, FMVZ-URCCH, Cuajinicuilapa, Gro. Mexico.

An experiment was conducted to study effects of sugar cane on ruminal fermentation and fiber digestion in crossbred steers fed stargrass. Sugar cane (SC) and stargrass (SG) were fed together to four crossed (*Bos taurus* x *Bos indicus*) steers (455 kg BW) with ruminal cannulae. A Latin square design experiment was used, and treatments were levels

(0, 1, 2, and 3% of BW) of chopped sugar cane (with 1% urea), whereas stargrass was fed ad libitum. Steers received SC at 0800, SG at 1200 and 2 kg of a high-protein supplement (23.4% CP) at 1300. Intake of SG was reduced linearly (P < 0.05) as SC level increased. Ruminal digestibility of DM, CP, NDF and ADF did not change (P > 0.05), although they tended to increase with higher proportions of SC, which was reflected in a linear increase (P < 0.12) in total DM digestibility (54.0, 53.3, 57.6, 60.9%). In situ digestibilities of SG and SC, VFA, and molar proportions of VFA were not affected (P > 0.05) by treatments. Results indicated that sugar cane can be used as a complementary forage with stargrass,