Item	Ultimate pH	Expressible moisture, mg/g	Color score[a]	Marbling score	TBA at d 6[b], mg/1000g
70% +VM -RAC	5.83	122	4.1	3.1	0.11
+VM +RAC	5.82	120	3.8	3.5	0.09
-VM -RAC	5.88	123	4.0	3.2	0.11
-VM +RAC	5.80	132	4.0	3.2	0.15
130% +VM -RAC	5.76	133	4.1	3.2	0.11
+VC +RAC	5.94	100	4.1	3.5	0.08
-VM -RAC	5.72	172	3.9	3.2	0.13
-VM +RAC	5.78	151	3.7	2.8	0.12
SE	0.06	23	0.1	0.2	0.02

[a]NPPC color (scale of 0 to 6) and marbling (scale of 0 to 10).
[b]TBA at d 6.

Key Words: Pork quality, Vitamins and minerals, Ractopamine

385 Effect of space allocation and ractopamine (Paylean®) on barrow growth performance and carcass characteristics. M C Brumm*[1], R C Thaler[2], and P S Miller[1], [1]*University of Nebraska,* [2]*South Dakota State University.*

Danbred USA barrows (n=264, 29.7 kg BW) were used to evaluate the effects of space allocation and ractopamine (Paylean®) (P) addition to finishing diets. Space allocations of .55 m^2 (CR) and .74 m^2 (UC) from arrival to slaughter were achieved by housing 19 or 14 pigs per fully slatted pen. Four weeks prior to slaughter, P treatments of 0 or 10 ppm in corn-soybean meal based diets formulated to contain 0.92% lysine and 16.1% CP were initiated within space allocation treatments. There were four pens per treatment combination. Diets contained 1.10% lysine from arrival to 36 kg BW, 0.97% from 36 to 69 kg and 0.77% from 59 kg to 4 weeks prior to slaughter. All UC pigs were slaughtered on d 86 (107.1 kg BW), with CR pigs slaughtered on d 93 (108.6 kg BW). There was no effect of 10 ppm P on ADG, but ADF decreased (2.70 vs 2.89 kg/d; P<0.01) and gain:feed improved (0.351 vs 0.322; P<0.01) vs the 0 ppm treatment during the 4 wk of P treatments. Overall, ADG (0.86 vs 0.91 kg; P<0.01) and ADF (2.32 vs 2.41 kg; P<0.1) were reduced for the CR vs UC treatments. While there was no effect of P on overall ADG or ADF, there was improvement in gain:feed (0.379 vs 0.368; P<0.10) for the 10 vs 0 ppm treatment. On d 86, all pigs were individually scored for severity of tail biting on a 1 to 4 scale with 1 being no evidence of tail biting and 4 severe tail biting. Space allocation (1.4 vs 1.3 mean score, CR vs UC respectively) and P treatment (1.5 vs 1.3, 10 vs 0 ppm respectively) had no effect (P>0.10) on tail biting. Although there was no effect of P on slaughter weight (107.8 kg BW), carcass yield increased slightly (75.3% vs 74.6%; P<0.10) for the 10 vs 0 ppm treatment. Carcass backfat measured by IPB, Inc personnel decreased for the CR vs UC treatments (15.0 vs 15.7 mm; P<.10). There was no effect of space allocation on loin muscle depth, estimated carcass % lean or IBP carcass merit. Barrows fed 10 ppm P had greater muscle depth (68.8 vs 67.0 mm; P<0.01), carcass lean (56.0 vs 55.5%; P<0.01) and carcass merit ($0.132 vs $0.122/kg; P<0.05) than the 0 ppm fed pigs. These results suggest that the response to P is independent of the response to altered space allocation.

Key Words: Pigs, Ractopamine, Space

386 Excessive amino acids limit the response to exogenous porcine Somatotropin (pST). D. Brana-Varela and J. A. Cuaron*, *CNI-Fisiologia y Mejoramiento Animal, INIFAP, Mexico.*

Two experiments were conducted to revise the effect of graded levels of pST (daily i.m. injections/28-d) and of dietary Lys. Relative to Lys, Thr, Met and Trp were constant and CP was ∼15.4×Lys. Exp. 1, a factorial arrangement of 3 pST doses (0, 3 and 6 mg/pig/d) and 3 Lys (g/kg, true ileal digestible) to energy (ME, Mcal/kg) ratios (LTE): 1.87 (6/3.2), 2.31 (7.5/3.25) and 2.76 (9.1/3.3), had 18 pens of 16 pigs (1:1 gilts and barrows) in a commercial farm affected by respiratory diseases. Pigs were weighed initially (99.9±2.3 kg) and every two weeks; Feed intake was recorded once every week; Fat and muscle depths at P2 were measured on the 10th and last ribs in the same interval by real time ultrasound scanning. Exp. 2 was the factorial arrangement of 3 pST levels (0, 2.5 and 5 mg/pig/d) and 3 dietary Lys densities (.7, .81 and .92%) at a fixed dietary energy level (ME, 3.2 Mcal/kg); Sex (barrows and gilts) was included as a factor. Pigs (72) were individually housed to 4 replications in the 3×3×2 interaction. Initial wt was 83.3±6 kg; Feed intake was measured daily; Body wt change was recorded weekly and lean eye area, fat and muscle depths were registered initially and on d-14 and 28. In Exp. 1, pST resulted in a linear (P<.004) reduction of feed intake (2.9, 2.6 and 2.4 kg/d), as identically did the LTE ratios. In the interaction, avg. daily feed intake (ADI) is depicted by the equation ADI=3.497-(.088×pST dose, mg/d)-(.11×LTE^2); P<.001, r=.91. While pST improved quadratically (P<.05) avg. of daily gain (ADG: 728, 805 and 793 g/d), LTE resulted in similar ADG (786, 771 and 770 g/d). Daily pST reduced linearly (P<.001) backfat change (4.2, 1.4 and -1.2 mm) but, in muscle depth change, pST and LTE interacted (P<.001). The response to Lys and pST in Exp. 2, was a linear decrease (P<.01) in ADI, but ADG resulted in a Lys×pST interaction (P<.06): at 0 (742, 716 and 765 g/pig) or 2.5 mg/pig/d (1003, 811 and 797 g/d), Lys resulted in none or a negative change, while the slope was positive (855, 960 915) with the 5 mg/d dose. Body composition was affected by pST, a linear reduction (P<.001) in backfat, or increments (P<.03) in muscle depth. If Lys concentration in the diet exceeds the requirement, the effects on ADI and ADG will be negative.

Key Words: Amino acids requirements, Somatotropin, Finishing pigs

Physiology
Estrus Synchronization I

387 Paired use of milk progesterone testing and a PreSynch OvSynch timed insemination protocol in lactating dairy cows. J.D. Ferguson[1], D.T. Galligan[1], J.W. Brooks*[2], G. Azzaro[2], S. Ventura[2], and G. Licitra[3], [1]*University of Pennsylvania,* [2]*Consorzio Ricerca Filiera Lattiero-Casearia, Ragusa, Italy,* [3]*University of Catania, Italy.*

The objective was to improve herd reproductive efficiency by using milk serum progesterone (P4) testing with a modified PreSynch OvSynch program. Nine test herds ranged in size from 30 to 140 lactating dairy cows. Milk samples were collected at 14 day intervals beginning at 3 weeks post partum. A threshold P4 concentration was calculated to classify samples as "high" or "low". Sampling continued for each cow until at least one "high" value was obtained, indicating cyclicity. Percentages of cows which began cycling at 5, 7, 9, and more than 9 wks were 72.9%, 15.7%, 8.3%, and 3.1% respectively of 420 cows. Thus, 27.1% of cows bred before 7 wks post calving are acyclic, meriting use of a milk P4 test to identify acyclic cows. At each of the first two samplings cows received 25 mg PGF2α (Dinolytic®, Pharmacia & Upjohn) for PreSynch. Cyclic animals continued with OvSynch beginning 14 days after the most recent sampling. Cows were administered 50 mg GnRH (Cystoreline®, VETEM) (d -10), followed by 25 mg PGF2α (d -3), then 50 μg GnRH (d -1) with AI to follow 8-18 hrs later (d 0). For possible reinsemination, all cows not returning to estrus were administered 50 mg GnRH 32 days after insemination (d 32), with rectal palpation for pregnancy to follow in 7 days (d 39). Thus, all normally cycling cows were inseminated at 59-65 d post calving and at 101-107 d post calving if non-pregnant at palpation. Reproductive data were also collected from 9 control herds (n=463) matched for cow number with test herds (n=482). First service CR for all animals was greater (P<0.05) in test herds than control herds (34% vs. 23%). Days to first breeding was lower for test cows than for control cows (66 vs. 73; SE=0.681 and SE=1.92). Upon completion of data collection, reproductive efficiency will be analyzed by survival anal-

ysis. The paired use of milk serum P4 testing and a modified PreSynch OvSynch protocol improved reproductive performance in these herds.

Key Words: P4, Synchronization, Cyclicity

388 The length of pregnancy modifies the association between the length of the dry period and subsequent milk yield. C Enevoldsen[1], [1]*Royal Veterinary and Agricultural University, Copenhagen, Denmark*.

Data were collected from 66 herds without and 61 herds (2464 lactations) with specific focus on dry cow management. The relation between length of the dry period and milk yield in subsequent lactation was analyzed with a random coefficient regression model. The dry period was divided into the planned dry period defined as the number of days from drying off to expected calving (under management control) and the deviation of pregnancy length from the expected 279 days (random component). In herds without specific focus on dry cow management there was an interaction between planned dry period, pregnancy length and peak milk yield in previous lactation. The combination of a three week planned dry period and a pregnancy length 10 days shorter than expected was associated with approximately 12 kg less milk per day at 60 days post partum in subsequent lactation compared to the combination of 10 week planned dry period and a pregnancy 10 days longer than expected. The effect of planned dry period was only 1-2 kg at a pregnancy 10 days longer than expected. Peak yield in previous lactation modified the response surface slightly. In herds with specific focus on dry cow management, dry periods cows with lower body condition score at drying off were usually dried off earlier and the variation in planned dry periods was substantially reduced. The combination of shorter planned dry periods and shorter pregnancy lengths was still associated with significantly less milk in subsequent lactation but the effect was much less pronounced compared with herds without focus on dry cow management. These findings indicate that both length of pregnancy and herd management policy with respect to dry cows must be taken into account in models of milk production.

Key Words: Dry period, Length of pregnancy, Milk yield

389 ECP induced changes in ovarian function of lactating dairy cattle. S. M. Pancarci*, J. A. Bartolome, T Dickerson, and W. W. Thatcher, *University of Florida, Gainesville, FL , USA*.

The ability of estradiol cypionate (ECP) to alter ovarian follicular and CL development was examined as a potential strategy to induce follicle turnover in a timed artificial insemination protocol (TAI). Cows were synchronized for estrus with GnRH (Cystorelin®; Merial Ltd., 100 μg, i.m.) and $PGF_{2\alpha}$ (Lutalyse®, 25 mg; i.m.) given 7 d apart. Cows detected in estrus were assigned to treatments (T) of a 2 x 3 factorial experiment. Cows were injected with either ECP (ECP®, Pharmacia Corp., 2 mg; i.m.) or cottonseed oil (CSO, 1ml, i.m.; control) on d2 (control, T1, n=6; ECP, T2, n=6), d5 (control, T3, n=6; ECP, T4, n=6), and d13 (control, T5, n=5; ECP, T6, n=6) of the estrous cycle. The day of initial ECP and CSO injection was designated experimental day (ED) 0. $PGF_{2\alpha}$ (25 mg, i.m.) was injected on ED10 followed by ECP (1 mg, i.m.) or CSO 24 h later. Ovaries were monitored by ultrasound and blood samples were collected daily from ED0 to subsequent CL formation. In the d13 groups, blood samples were collected hourly for 12 h after the initial injections of ECP and CSO to monitor the metabolite of $PGF_{2\alpha}$ (PGFM). ECP treatment induced an earlier deviation (T x d2-5 vs 13; P<0.02) of the newly recruited follicle on d2 (8.8 < 10.7 d) and d5 (7.3 < 10.3 d) but not on d13 (10.8 $\sim$ 9.8 d). Homogeneity of regression curves for size of the new recruited dominant follicles were not parallel (P< 0.01) between treatments and reflected an earlier growth in response to ECP on d2 and 5 but not on d13. ECP treatments suppressed growth of the existing dominant follicles on d2, 5 and 13 based upon homogeneity of regression (T x ED; P< 0.01). ECP attenuated mean concentrations of plasma progesterone (5.8 $\pm$ 0.5 < 8.3 $\pm$ 0.6 ng/ml; P< 0.01) indicative of an antiluteotrophic effect of ECP. ECP failed to induce release of PGFM on d13 of the estrous cycle. Examination of follicular dynamics in response to ECP indicates that ECP may be used during the metestrus to mid-diestrus periods at the beginning of a TAI protocol to induce follicle turnover.

Key Words: ECP, follicle dynamics, corpus luteum

390 Estrus, ovarian, and hormonal responses after resynchronization with progesterone (P4) and estrogen in lactating dairy cows of unknown pregnancy status. S.Z. El-Zarkouny*, B.A. Hensley, and J.S. Stevenson, *Kansas State University*.

Our objective was to determine if the first eligible estrus after AI could be resynchronized in cows of unknown pregnancy status. On d 13 after timed AI (TAI=d 0; Ovsynch protocol), a used CIDR was inserted for 7 d. Cows received no further treatment (controls) or were treated with estradiol benzoate (EB; 1 mg) or estradiol cypionate (ECP; 0.5 or 1 mg) on d 13 and 21. Blood samples were collected from d 13 to 24 for later determination of P4 and estradiol-17β (E2). Ovarian structures were mapped in 63 cows from d 13 to 24 and in 121 more cows from d 20 to 24. Pregnancy status was verified on d 28 and 56 by ultrasonography of uterine contents. Both doses of ECP and EB affected neither feed intake nor milk yield during 11 d after d 13. Injections of estrogen had no detrimental effect on established pregnancies (d 28): 41% (n=51), 41% (n=48), 37% (n=44), and 39% (n=47) for control, EB, ECP-0.5, and ECP-1. Subsequent embryo survival to d 56 was less (P<0.05) after EB (62%) than controls (86%), ECP-0.5 (69%), and ECP-1 (89%). In open cows, concentrations of P4 on d 13 to 24 were less (P<0.05) after EB (1.8 0.4 ng/mL), ECP-0.5 (2.4 0.4 ng/mL), and ECP-1 (1.6 0.4 ng/mL) than in controls (2.8 0.4 ng/mL), whereas no decrease occurred in pregnant cows. Peak concentrations of E2 were greater (P<0.05) in estrogen-treated cows on d 14 and 22 than in controls, but E2 remained elevated longer to d 16 and 24 after EB and ECP-1. Appearance of a new dominant follicle after estrogen on d 13 occurred earlier (P<0.05; 2.6 0.5 d) than controls (4.3 0.7 d). More (P<0.05) open cows treated with estrogen ovulated after d 21 (70%; n=64) than controls (42%; n=24), whereas in pregnant cows the percentages were similar (5%; n=45 vs. 5%; n=20), respectively. Of 122 open cows, 61% were detected in estrus between d 21 and 26 and their conception rates did not differ (control=31%, n=16; EB=30%, n=20; ECP-0.5=38%, n=24; ECP-1=31%, n=16). Number of standing events (P=0.11), duration of standing time (P<0.05), and interval to estrus (P=0.10) after d 21 were greater for EB than ECP cows. We conclude that estrogen+CIDR protocol had no detrimental effects on established pregnancies, ovarian responses, and subsequent conception.

Key Words: Estrogen, Estrus Resynchronization, Progesterone

391 Effect of milking frequency (MF), estradiol cypionate, and bST on milk yield and reproductive outcomes in dairy cows. C.A. Blevins*, J.J. Aberle, J.E. Shirley, B.A. Hensley, S.M. Tiffany, and J.S. Stevenson, *Kansas State University*.

Our objectives were to determine the outcome of lactation and reproductive performance, based on MF, estradiol cypionate (ECP), and bST. Lactating cows were blocked by parity (1 vs. 2+) and assigned randomly to a 2 × 2 × 2 factorial experiment: 1) MF consisted of 4× daily (4X) milking for the first 30 DIM vs. 2× daily (2X) milking, with all cows milked 2× after 30 DIM; 2) 10 mg of ECP given as postpartum therapy (ECPT) before 10 DIM vs. controls that received ECP diluent (cottonseed oil; CSO); and 3) biweekly bST starting after 60 DIM vs. no bST. Milk yields were measured daily and then averaged for 0-30, 31-60, and 61-90 DIM. Ovulation before AI was synchronized using 100 μg of GnRH 7 d before 25 mg of $PGF_{2\alpha}$, followed in 24 h by 1 mg of ECP beginning between 59 and 72 DIM. Cows were inseminated after detected estrus or at 48 h after ECP. Pregnancy rates were assessed by transrectal ultrasonography 28-30 d after AI. The 4X cows (n=73) had greater (P<0.01) milk yields (33.1 0.8 kg) through 30 DIM than 2X cows (29.9 0.8 kg, n=70). An interaction (P<0.05) of MF with ECPT was detected for milk yields (kg) through 60 DIM (2X+CSO = 33.2 1.1, n=34; 2X+ECPT = 35.3 1.1, n = 36; 4X+CSO = 36.5 1.1, n=36; 4X+ECPT = 34.3 1, n=37). An interaction (P=0.10) of treatments was detected for milk yields from 61-90 DIM: 2X+CSO+no bST = 37.9 1.5, n=16; 2X+CSO+bST = 39.1 1.4, n=18; 2X+ECPT+no bST = 38.9 1.4, n=17; 2X+ECPT+bST = 39.9 1.3, n=19; 4X+CSO+no bST = 39.2 1.5, n=16; 4X+CSO+bST = 39.8 1.3, n=20; 4X+ECPT+no bST = 33.1 1.4, n=17; 4X+ECPT+ bST = 40.0 1.3, n=20). Percentage of cows in estrus was greater (P<0.01) for 2X+CSO (66.7%; n=33) than for 2X+ECPT (47.2%; n=36), 4X+CSO (41.7%; n=36), and 4X+ECPT (44.4%; n=36). Pregnancy rates were greater (P<0.05) in ECPT (48.6%; n=72) than in CSO (33.3%; n=69) cows. Increased fertility also was found for bST cows (44.4%; n=36) vs. controls (40.0%,

n=105). In conclusion, early postpartum ECP therapy increased pregnancy rates, however it had detrimental effects on milk yields when cows were milked 4× daily unless treated with bST.

Key Words: Estradiol Cypionate, bST, Milking Frequency

392 Synchronization of estrus in dairy cows using prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$), gonadotropin-releasing hormone (GnRH), and estradiol cypionate (ECP). J. M. Borman*[1], R. P. Radcliff[2], B. L. McCormack[2], F. N. Kojima[2], D. J. Patterson[2], K. L. Macmillan[1], and M. C. Lucy[2], [1]*University of Melbourne, Werribee, Australia,* [2]*University of Missouri, Columbia, MO.*

An estrous synchronization protocol was developed for use in lactating dairy cows using $PGF_{2\alpha}$, GnRH, and estradiol cypionate (ECP). In Experiment 1, cows received two injections of $PGF_{2\alpha}$ (on d 0 and 11) (PP; n = 10) or two injections of $PGF_{2\alpha}$ (d 0 and 11) and 100 μg of GnRH on d 3 (PGP; n = 10). In Experiment 2, cows were treated with PGP (n = 7), or PGP and 1 mg of ECP at the same time ($PGPE_0$; n = 7) or 1 d after the second $PGF_{2\alpha}$ injection ($PGPE_1$; n = 7). In Experiment 3, 101 lactating dairy cows in a commercial herd were assigned to one of three treatments; PP, PGP, or $PGPE_1$. Follicular growth was measured by ultrasound in Experiment 1 and 2. All cows were blood sampled for progesterone and estradiol analyses and inseminated at estrus. In Experiment 1, a higher percentage of GnRH-treated cows ovulated after the first $PGF_{2\alpha}$ injection (90 vs. 50%; $P < 0.05$) and GnRH-treated cows tended to have larger dominant follicles at the time of the second $PGF_{2\alpha}$ injection (16.5 ± 0.5 vs. 15.0 ± 0.7 mm; $P < 0.10$). The percentage of cows that ovulated after the second $PGF_{2\alpha}$ injection was similar (60%). In Experiment 2, ECP-treated cows had higher preovulatory plasma estradiol concentrations (3.6 ± 0.6, 6.9 ± 0.6, and 7.0 ± 0.6 pg/ml; $P < 0.01$; PGP, $PGPE_0$, and $PGPE_1$ respectively) following the second $PGF_{2\alpha}$ injection and a higher percentage ovulated (43, 86, and 86%; $P < 0.05$; PGP, $PGPE_0$, and $PGPE_1$ respectively). In Experiment 3, a higher percentage of $PGPE_1$ cows were observed in standing estrus (26, 34, and 63%; $P < 0.01$) and ovulated (56, 63, and 78%; $P < 0.05$) (PP, PGP and $PGPE_1$ respectively) after the second $PGF_{2\alpha}$ injection. In conclusion, the PGP protocol increased the number of cows that ovulated after the first $PGF_{2\alpha}$ injection and produced a more mature dominant follicle at the time of the second $PGF_{2\alpha}$ injection. Adding ECP to PGP ($PGPE_1$) enhanced the expression of estrus and improved ovulation percentage.

Key Words: Estrus Synchronization, Estradiol, Dairy Cows

393 The use of ovsynch and heatsynch for re-synchronization of cows open at pregnancy diagnosis by ultrasonography. JA Bartolome*, FT Silvestre, ACM Arteche, S Kamimura, LF Archbald, and WW Thatcher, *University of Florida, Gainesville, Florida, USA.*

Ultrasonography (US) allows pregnancy diagnosis 27 d after breeding and re-synchronization of open cows. The objective was to compare pregnancy rates (PR) in open cows at US on Day 27 after insemination and re-synchronized using Ovsynch or Heatsynch. A total of 315 open cows was assigned randomly on Day 0 to two groups. Cows in Ovsynch (n=155) received 100 μg GnRH (im; Cystorelin, Merial Ltd) on Day 0, 25 mg $PGF_{2\alpha}$ (im; Lutalyse, Pharmacia) on Day 7, 100 μg GnRH on Day 9, and time-inseminated 16 h later. Cows in Heatsynch (n=160) received 100 μg GnRH on Day 0, 25 mg $PGF_{2\alpha}$ on Day 7, 1 mg estradiol cypionate (im; ECP, Pharmacia, Kalamazoo, MI 49001) on Day 8, and time-inseminated 48 h later. In both groups, cows that showed estrus on Day 9 were inseminated. On Day 0 cows were classified in stages of the estrous cycle based on uterine and ovarian findings at rectal palpation and US (5 MHz, Aloka 500®). Stages were: diestrus-presence of a CL and a follicle > 12 mm; metestrus-uterine edema, a corpus hemorrhagicum and no follicles > 12 mm; proestrus-uterine tone and a follicle > 12 mm; cystic-multiple follicles > 20 mm, absence of CL and lack of uterine tone. On Day 0, season, parity, previous services and inseminator were recorded. PR was compared by multiple logistic regression (Proc Genmod, SAS). PR was 18.0% (28/155) for Ovsynch and 18.7% (30/160) for Heatsynch. The odds of pregnancy were similar between Heatsynch and Ovsynch (OR=0.9; 95% CI= 0.54-1.7; P=0.87). PR according stages of the estrous cycle for Ovsynch were: diestrus 19% (15/79), metestrus 9.5% (2/21), proestrus 14.7% (5/34), and cystic 28.6% (6/21). PR for Heatsynch were: diestrus 15.7% (11/70), metestrus 44.4% (12/27), proestrus 12.8% (5/39), and cystic 8.3% (2/24). For cows in metestrus the odds of pregnancy were higher for Heatsynch (OR=7.6; 95% CI= 12.8-4.5; P<0.05). In contrast, for ovarian cysts, the odds of pregnancy were higher for Ovsynch (OR=4.4; 95% CI= 6.5-2.9; P<0.05). In conclusion, similar PR was obtained by using Ovsynch or Heatsynch for re-synchronization. However, Heatsynch increases PR for cows in metestrus, and Ovsynch for cows with ovarian cyst.

Key Words: Re-synchronization, Timed-insemination, Dairy cows

394 Incidence and timing of estrus, LH surge, and ovulation in cows treated with the Ovsynch protocol with estradiol cypionate (ECP) substituting for GnRH. J.S. Stevenson*[1], S.M. Tiffany[1], and M.C. Lucy[2], [1]*Kansas State University,* [2]*University of Missouri.*

Our purpose was to determine whether ECP could be substituted for the second GnRH injection of the standard Ovsynch protocol (injection of GnRH given 7 d before and 48 h after $PGF_{2\alpha}$; PGF) with timed AI (TAI) 16 h after the second GnRH. Lactating dairy cows ranging from 61 to 82 DIM at TAI were studied in 13 replicates. Four treatments using the Ovsynch protocol were created: GnRH used as the control 48 h after PGF (GnRH; n=28); as GnRH plus a CIDR in place for 7 d beginning at the first GnRH injection (GnRH+CIDR, n=20); ECP (same as GnRH but substituting 1 mg of ECP for GnRH 24 h after PGF and TAI 48 h later [n=37]); or ECP+CIDR (n=26). The largest follicle was identified by ultrasonography 24 h after PGF and continually monitored every 6 h beginning 70 h after PGF until its disappearance (ovulation). In three replicates, blood was collected from cows in tie stalls at 0-6, 8, and 10 h after GnRH and at 24-30 and every 2 h until 58 h after ECP to determine incidence, timing, duration, and peak of the induced LH surge. In four replicates, HeatWatch# devices were affixed to cows housed in free stalls to monitor estrus. Intervals from ECP to estrus were 253 h (n=16), to the LH surge (412 h; n=14), and to ovulation (611 h; n=35). More (P<0.01) cows showed estrus after PGF when given ECP (40%; n=63) than GnRH (8%; n=48), whereas incidence of ovulation was less (P<0.01; ECP=59%; n=59 vs. GnRH=83%; n=46). Incidences of LH surges after ECP (82%; n=11) and GnRH (90%; n=10) were similar, whereas the CIDR was detrimental before ECP (42%; n=12) but not before GnRH (89%; n=9). Duration of LH surges was less (P<0.01) after GnRH (6 1 h; n=17) than after ECP (111 h; n=14), but no difference in its peak after ECP (3.71 ng/mL, n=14) and GnRH (5.81 ng/mL; n=17). Conception was greater (P<0.05) for ECP+CIDR (39%, n=26) than for ECP alone (22%; n=37), whereas the reverse occurred with GnRH+CIDR (5%; n=20) than for GnRH alone (43%; n=28). We conclude that substituting ECP for GnRH resulted in more cows in estrus, fewer ovulating, with little effect on fertility.

Key Words: Ovulation, Estrogen, Estrus

395 Effects of differences in dietary protein on the production and quality of bovine embryos collected from superovulated donors. F.D. Jousan*, M.D. Utt, and W.E. Beal, *Virginia Polytechnic Institute and State University.*

High levels of dietary protein may be detrimental to reproductive performance in cattle. The objective of this experiment was to determine the effects of differences in dietary protein on the production and quality of bovine embryos collected from superovulated donors. Angus cows were randomly assigned to receive one of three experimental diets: a daily ration of 5.7 kg broiler litter, 2.0 kg hay, 3.1 kg corn, and 0.5 kg peanut hulls (LITTER; n=15); a daily ration of 6.2 kg peanut hulls, 2.2 kg soybean meal, 2.0 kg hay, 0.5 kg corn, and 0.4 kg dicalcium phosphate (SBM; n=15); or a daily ration of 6.2 kg peanut hulls, 2.0 kg hay, and 3.1 kg corn (CON; n=19). Diets differed in the amount of total, soluble and degradable protein, but were comparable in energy (see table). After 30 d on the diets all cows were treated to induce superovulation (28.8 mg FSH/cow, Folltropin) and synchronize estrus. After the detection of estrus each cow was inseminated with semen from one of four Holstein bulls. Embryos were collected 7 d after estrus and evaluated for quality (IETS standards) and stage of development. Prior to treatment to induce superovulation blood samples were collected 6 h after feeding. Samples were analyzed to assess dietary effects on plasma urea nitrogen (PUN). Mean levels of PUN were higher (P<.01) in cows fed the LITTER or SBM diet (16.3 mg/dL LITTER; 21.8 mg/dL SBM; 9.7 mg/dL CON) than in cows fed the CON diet. PUN was higher in cows fed SBM than in those fed LITTER (P<.01). An average of 9.1 transferable embryos (Grade 1-3) were collected from each cow and

there were no significant differences in the number of transferable embryos collected among groups (9.2 LITTER; 9.3 SBM; 9.1 CON). The number of degenerate embryos or unfertilized ova did not differ among dietary groups. High-protein diets elevated PUN, but did not affect the number or quality of embryos collected.

Diet	CP (%)	Soluble CP (%)	Degradable CP (%)	TDN (%)
LITTER	16.4	78.0	71.1	65.6
SBM	17.9	27.9	64.8	55.1
CON	9.2	29.0	49.9	57.5

Key Words: Cattle, Dietary Protein, Embryo

396 Prostaglandin synchronization before synchronized ovulation for first insemination in lactating dairy cows. S.J. LeBlanc* and K.E. Leslie, *University of Guelph, Ontario, Canada*.

Previous research has shown that conception risk with the Ovsynch breeding program is maximized when the program is initiated 5 to 12 days after estrus. The objective of this double-blinded field trial was to assess the effect of one injection of prostaglandin F2α (PGF2α), 10 days before the Ovsynch program, on the risk of pregnancy at first insemination in lactating dairy cows. The hypothesis was that cows that underwent luteolysis in response to PGF2α would be between 5 and 8 days post-estrus at the start of Ovsynch. In 5 commercial dairy herds in Ontario, Canada, at 52 ($\pm$12) DIM, 506 cows were assigned at random to receive either one i.m. injection of 500 μg cloprostenol or saline. Ten days later, all cows received 100 μg GnRH i.m., followed in 7 days by 500 μg cloprostenol i.m. and 100 μg GnRH i.m. 48 hours later. All cows were artificially inseminated 0 to 20 hours after the second injection of GnRH, without regard to detection of estrus. Pregnancy was diagnosed by trans-rectal palpation at least 35 days after insemination. The probability of pregnancy after first insemination was modeled with logistic regression, accounting for the correlation of cows with herd. Overall, there was no difference in pregnancy risk between cows that received PGF2α presynchronization and controls (37.3% and 36.6%, respectively; odds ratio = 1.02, 95% confidence interval, 0.87 to 1.19, P = 0.84). Herd, parity, and DIM at insemination covariates were not significant. However, among 248 cows bred before 71 DIM, pregnancy risks were 34.2% and 39.8% for presynchronized and control cows, respectively. Conversely, among 258 cows bred after 70 DIM, pregnancy risks were 40.2% and 33.3%, respectively. These apparent differences may merit further investigation. Although progesterone measurements were not performed, we speculate that overall, many cows did not undergo luteolysis and subsequent estrus following the injection of PGF2α. These results are consistent with the necessity for cows to be cyclic to benefit from PGF2α pre-synchronization for increased pregnancy risk following Ovsynch timed insemination.

Key Words: Presynchronization, Prostaglandin, Timed Insemination

397 Administration of human chorionic gonadotrophin (hCG) or gonadotrophin releasing hormone (GnRH) analogue at day 5 after oestrus and plasma progesterone in the cow. LM Hicking*, APF Flint, and GE Mann, *University Of Nottingham, UK*.

Adequate progesterone (P_4)secretion is critical during early pregnancy in the dairy cow. Low P_4 levels on day 5 lead to poor embryo development and pregnancy loss. In this study, cows were treated on day 5 of a synchronised cycle with hCG or GnRH, to investigate effects on P_4 secretion. In experiment 1, 4 non-lactating multiparous Holstein-Friesian cows were treated with GnRH analogue (Buserelin ®, 10μg i.m.) or left as untreated controls during two consecutive cycles in a Latin square design. Jugular venous blood samples were collected at 4-hourly intervals for 72 hours following GnRH administration. Plasma P_4 concentration was not affected by GnRH treatment (GnRH, 3.7$\pm$0.6ng/ml; control, 3.1$\pm$0.7ng/ml). In experiment 2, a similar protocol was employed with 12 cows receiving hCG (Chorulon®, 1500 IU i.m.) or left as untreated controls during two consecutive cycles. On day 8 of the second cycle animals were slaughtered and ovaries recovered. Mean plasma P_4 was raised ($P<0.05$) throughout the sampling period (hCG, 5.6$\pm$0.5ng/ml; control, 4.0$\pm$0.3ng/ml). Original corpus luteum (CL) weight was higher ($P<0.001$) in treated animals (hCG, 8.4$\pm$0.5g; control, 5.4$\pm$0.4g). P_4 secretion by luteal tissue *in vitro* (30min incubation) revealed no effect of treatment (hCG, 8.3$\pm$1.7; control, 7.7$\pm$1.1ng/mg/ml). There was an increase ($P<0.001$, ng/mg luteal tissue; $P<0.05$, μg/CL) in P_4 production by luteal tissue from all animals when incubated with LH (100ng/ml). There was no treatment$*$LH interaction. P_4 content of the CL was greater ($P<0.05$) for treated animals prior to incubation. In conclusion, administration of hCG, but not GnRH, on day 5 resulted in sustained stimulation of P_4 production associated with increased CL size without a reduction in P_4 content. This treatment should provide a suitable approach to raising P_4 in animals exhibiting a deficiency and hence to improving postpartum pregnancy rates.
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Key Words: hCG, GnRH, Progesterone

398 The effect of bromocryptine on the ovulation rate of ewes of different fecundity and ovulation rate. V. Fuentes[1], R. Sanchez, and P. Fuentes, [1]*Centro Universitario de los Altos Universidad de Guadalajara, México*.

Bromocryptine was administered im in doses of 1 mg at 12 hour intervals, to ewes of different fecundity and ovulation rate with the objective of decreasing blood prolactin levels during a complete estrous cycle and to observe this effect on their ovulation mate. The experiment was carried out in November 1999 and repeated in January 2000. For this purpose Finnish Landrace and Scottish Black Face ewes were used because of their high and low ovulation rates respectively. On the first study ovulation rate was not affected by the low prolactin levels induced by the drug. Ovulation rate in Finish Landrace was 3.85 0.69 for the control and 3.42 0,53 for the treated group. Similar results were observed in Scottish Black Face ewes ovulation rate was 1.12. 0.35 in the control group in treated ewes ovulation rate was 1.37 0.51. When the experiment was repeated on January 2000 the results were similar.

Key Words: bromocryptyne, ewes, ovulation

Production, Management, and the Environment
Beef and Swine Management

399 Cooling and feeding strategies to reduce heat load in feedlot cattle. J.B. Gaughan*[1], S.M. Holt[2], and T.L. Mader[3], [1]*The University of Queensland,* [2]*South Dakota State University,* [3]*University of Nebraska*.

Six Bos taurus steers (mean wt = 288 kg) were used in a 102-d 2 x 2 Latin Square study. The steers were housed in individual stalls in a controlled climate room. Cooling treatments (ENV) were (i) sprinkling during hottest part of day (0800 # 1500 h) (DC), and (ii) sprinkling at night (1600 # 0700 h) (NC). The dietary treatments (DIET) were (i) control (CON), and (ii) protected fat (PF). The diets (60/% concentrate # sorghum based and 40/% roughage) were iso-caloric and iso-nitrogenous (90/% DM; 23.6/% NDF; 12 MJ ME/kg DM; 16.3/% CP/kg DM). A rumen protected fat was added at the rate of 5/% to the PF diet. Feed was offered ad libitum. Mean THI between 0800 h # 1500 h was 89, and between 1600 # 0700 h was 78. Respiration rate (RR; breaths/min; bpm) and rectal temperature (oC; RT) were measured hourly over 12 24 h periods, while DMI was measured using load cells. ENV had a significant effect on mean daily RR ($P<.001$; DC = 88.3 2.4 bpm; NC = 56.1 2.4 bpm), and on mean daily RT ($P<.001$; DC = 39.2 .1 oC; NC = 38.7 .1 oC). The DC steers had a RR greater than 100 bpm (max 133) for 10 hours, and 80 bpm or lower for 10 h each day. The NC steers spent 3 hours per day with a RR greater than 100 bpm (max 200), and 17 h with a RR of 80 bpm or lower. There were no ENV x DIET interactions or DIET effects for RR or RT. There were ENV x DIET