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PHYSIOLOGY AND ENDOCRINOLOGY:  
ADVANCES IN ESTROUS  
SYNCHRONIZATION

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**0536 Detrimental effect of long term progestin-based protocol on oocyte quality and embryonic development in indigenous goats.** C. Navanukraw\*<sup>1</sup>, A. Kraison<sup>2</sup>, J. Thammasiri<sup>2</sup>, V. Khanthusaeng<sup>2</sup>, and S. Navanukraw<sup>2</sup>, <sup>1</sup>*Khon Kaen University, Khon Kaen, Thailand*, <sup>2</sup>*Department of Animal Science, Khon Kaen University, Khon Kaen, Thailand*.

Long-term progesterone treatments for estrus synchronization have been associated with a lesser fertility in ruminants. This experiment was conducted to determine the effects of short-term (7 d) and long-term (14 d) progestin based and pregnant mare serum gonadotropin (PMSG) administration on number of follicles, oocyte quality, and embryonic development in goats. Nulliparous Thai-native goats ( $n = 36$ ) were randomly assigned into short-term and long-term protocols. Goats in the short-term protocol were inserted with intravaginal sponges containing 60 mg medroxyprogesterone acetate (MAP; Synchrogest esponjas, Spain) for 7 d. Goats in the second group were inserted with the same synthetic progesterone for 14 d. Multiple follicular development was induced by intramuscularly injections of 300 IU PMSG (Synchrogest PMSG, Spain) in both groups on d 6 or d 13 (1 d before sponge withdrawal). Ovariectomy was performed at 24 h after sponge removal to evaluate number of follicles and collect oocyte for in vitro fertilization (IVF). Oocyte quality was determined by morphology of cumulus oocyte complex before in vitro maturation (IVM) as healthy or nonhealthy oocyte. After IVF, embryo was evaluated during the 8-d culture as numbers of cleaved oocyte, morula, and blastocyst embryo. Total numbers of follicles and oocytes were similar for both treatments. Plasma progesterone concentrations were not different during MAP insertion period ( $P > 0.05$ ). However, goats that received the short-term protocol had greater number of follicles 4 to 6 mm, number of healthy oocytes, number of cleaved oocytes, and number of morula embryos than goats received the long term protocol ( $P < 0.01$ ). These data highlight the detrimental effect of long term progestin-based protocol on oocyte quality and embryonic development in goats.

**Key Words:** synthetic progesterone, oocyte quality, indigenous goat

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**0537 Exogenous insulin effect on reproductive traits during a Heatsynch protocol in dairy cows.**

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The objective of this study was to evaluate the effects of exogenous insulin administration on reproductive traits in a Heatsynch protocol in dairy cows. Thirty-three multiparous Holstein cows, in a body condition score of 2.5 (on a 5-point scale) reared in a grazing system in Southern Brazil were submitted to a Heatsynch protocol at  $84 \pm 14$  d in milk with an average of  $28.33 \pm 1.4$  kg/d milk. The protocol consisted of one 25  $\mu$ g of GnRH analogue i.m. injection, and insertion of an intravaginal device with 1.9 g of progesterone (CIDR, controlled internal drug release device) on d 0. Seven days later (d 7) the CIDR insert was removed and cows were given 25 mg PGF<sub>2</sub> $\alpha$  i.m., followed by 1 mg of estradiol cypionate i.m. (ECP) injection at d 8. At CIDR removal (d7) cows were randomly divided into 2 groups: The insulin group ( $n = 14$ ) was given 0.25 IU/kg s.c. human insulin, and the control group ( $n = 19$ ) was subjected to the same synchronization protocol, but without insulin injection. On the same day, blood samples were collected from the coccygeal and serum samples were analyzed for insulin concentrations. From d 8 to 10, cows that demonstrated estrus signs were then inseminated 12 h after detection. Follicular diameter evaluations were performed by transrectal ultrasonography on d 7, 9, and 10 of the protocol. The measurement of the increase in size of the dominant follicle was considered to be preovulatory follicular growth. Data were analyzed using the GLM procedures of NCSS (2005). There was no insulin concentration difference ( $P = 0.61$ ) between groups at CIDR removal, which were respectively  $25.8 \pm 2.4$  and  $27.5 \pm 2.4$  ng/mL for control and insulin. Insulin administration did not affect ( $P = 0.85$ ) pre-ovulatory follicular growth, being  $5.16 \pm 0.5$  mm and  $5.28 \pm 0.6$  mm, for the insulin and control groups, respectively. The interval from CIDR removal to AI was similar between groups ( $P = 0.81$ ), being  $59.6 \pm 3.4$  and  $60.8 \pm 3.4$  h, respectively, for insulin and control groups. Also, no insulin concentrations difference ( $P = 0.81$ ) were found in cows showing estrus signs or not,  $26.32 \pm 2.5$  and  $27.23 \pm 2.9$  ng/mL, respectively. In conclusion, exogenous insulin injection has no effect on reproductive traits in a Heatsynch protocol in dairy cows.

**Key Words:** artificial insemination, efficiency, reproduction

**0538 Effects of administration of prostaglandin F<sub>2α</sub> at initiation of the 7-d CO-Synch+CIDR estrus synchronization protocol for suckled beef cows.**

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We determined the effect of administration of prostaglandin F<sub>2α</sub> (PGF<sub>2α</sub>) at CIDR (controlled internal drug release device) insertion during the 7-d CO-Synch+CIDR estrus synchronization protocol on subsequent pregnancy rates of suckled beef cows. At 13 locations, cows were ovulation synchronized with the 7-d CO-Synch + CIDR protocol (100 µg injection of GnRH at CIDR insertion [d -10] with 25 mg injection of PGF<sub>2α</sub> at CIDR removal [d -3], followed by an injection of GnRH and fixed-time AI [TAI] on d 0). Cows were stratified by days postpartum, BCS, and parity, and assigned to 1 of 2 treatments: CO-Synch + CIDR (*n* = 819) and PG-CO-Synch + CIDR (a 25-mg injection of PGF<sub>2α</sub> was administered at CIDR insertion of the CO-Synch + CIDR protocol; *n* = 827). Follicle dynamics and corpus luteum development were assessed on d -10 and -3, and pregnancy status determined on d 30 to 35. Blood was collected on d -20, -10, -3, and 0 to determine progesterone (P4). Overall TAI pregnancy rates (53.5 ± 1.9% and 50.4 ± 1.9%, for CO-Synch + CIDR and PG-CO-Synch + CIDR, respectively) did not differ (*P* = 0.802) between treatments. A location effect (*P* < 0.001) existed with pregnancy rates being the greatest at the KS2 location (67.2 ± 6.1%) and the poorest at the KS4 location (15.3 ± 5.3%). Of the 1217 cows in which cyclic status was assessed, 55% were determined to be cyclic; however, incidence of pregnancy was not associated with cyclic status or the treatment × cyclic status interaction. Concentrations of P4 were greater (*P* < 0.001) for CO-Synch + CIDR (4.1 ± 0.3 ng/mL) than PG-CO-Synch+CIDR (3.4 ± 0.3 ng/mL) on d -3, whereas diameter of largest follicle on d -3 tended (*P* = 0.094) to be greater for PG-CO-Synch + CIDR (13.4 ± 0.3 mm) than CO-Synch + CIDR (12.6 ± 0.3 mm). We concluded that administration of PGF<sub>2α</sub> at CIDR insertion of the CO-Synch + CIDR protocol failed to increase TAI pregnancy rates in suckled beef cows, but at CIDR removal, decreased concentrations of P4 and tended to increase dominant follicle diameter.

**Key Words:** ovulation synchronization, artificial insemination, beef cow

**0539 Split-time artificial insemination: Delayed insemination of nonestrous beef heifers in timed artificial insemination following the 14-d CIDR-PG protocol.**

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An experiment was designed to test the hypothesis that pregnancy rates in beef heifers after fixed-time artificial insemination (FTAI) may be improved by delaying insemination of those heifers that have not expressed estrus before the standard FTAI time. Estrus was synchronized for 931 heifers across 3 locations using the 14-d CIDR-PG protocol (CIDR insert [controlled internal drug release, 1.38 gm progesterone] on d 0 with removal of CIDR on d 14; 25 mg PGF<sub>2α</sub> 16 d after CIDR removal on d 30; and 100 µg GnRH on d 33, 66 h after PGF<sub>2α</sub>). Estrous detection aids (Estroject) were applied at PGF<sub>2α</sub> on d 30, and expression of estrus was recorded at GnRH on d 33. Treatments were balanced across locations, and heifers within each location were randomly assigned to 1 of 2 treatments based on reproductive tract score (RTS) and weight: (1) FTAI (concurrent with GnRH, 66 h after PGF<sub>2α</sub>) regardless of estrous expression prior or (2) FTAI for heifers having expressed estrus, and delayed AI (20 h after GnRH) for heifers failing to express estrus. A significant effect of treatment was found on AI pregnancy rate, with heifers assigned to treatment 2 achieving a higher AI pregnancy rate than heifers assigned to treatment 1 (54 vs. 46%, *P* = 0.012). The observed increase in AI pregnancy rate is attributed to the delayed AI of nonestrous heifers in Treatment 2, as AI pregnancy rates for nonestrous heifers were significantly greater for Treatment 2 (49 vs. 34%, *P* = 0.024), while AI pregnancy rates of estrous heifers did not differ by treatment (*P* = 0.244). In summary, FTAI pregnancy rates in heifers can be improved through a strategy of split-time AI at the standard time of 66 h after PGF<sub>2α</sub> for heifers that have expressed estrus and delayed insemination at 20 h after GnRH for heifers that have not expressed estrus before the standard AI time in the 14-d CIDR-PG protocol.

**Key Words:** artificial insemination, estrus synchronization, beef heifer

**0540 Split-time artificial insemination: Delayed insemination of nonestrous beef cows in timed artificial insemination following the 7-d CO-Synch + CIDR protocol.**

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An experiment was designed to test the hypothesis that pregnancy rates in postpartum beef cows after fixed-time artificial insemination (FTAI) may be improved by delaying insemination of those cows that have not expressed estrus before the

standard FTAI time. Estrus was synchronized for 951 mature, suckled cows across 9 locations using the 7-d CO-Synch + CIDR (controlled internal drug release device) protocol (100 µg GnRH + CIDR [1.38 gm progesterone] on d 0; 25 mg PGF<sub>2α</sub> at CIDR removal on d 7; and 100 µg GnRH on d 10, 66 h after CIDR removal). Estrus detection aids (Estroject) were applied at PGF<sub>2α</sub> and CIDR removal on d 7, and estrous expression was recorded at GnRH on d 10. Treatments were equally represented across locations, and cows within each location were assigned to 1 of 2 treatments based on age, days postpartum (DPP), and body condition score (BCS): (1) FTAI (concurrent with GnRH, 66 h after PGF<sub>2α</sub>) regardless of estrous expression before GnRH, or (2) FTAI for cows having expressed estrus, and delayed AI (20 h after GnRH) for cows failing to express estrus. In both treatments, cows that expressed estrus before FTAI achieved higher pregnancy rates than cows that did not ( $P < 0.0001$ ). However, no significant effect of treatment was found on AI pregnancy rate ( $P = 0.757$ ). In summary, mature suckled beef cows may be successfully artificially inseminated using a strategy of split-time AI at the standard time of 66 h after PGF<sub>2α</sub> for cows that have expressed estrus, and delayed insemination at 20 h after GnRH for cows that have not expressed estrus before the standard AI time in the 7-d CO-Synch + CIDR protocol. However, such a strategy does not appear to offer a significant improvement in pregnancy rates compared with a standard FTAI approach.

**Key Words:** artificial insemination, estrus synchronization, beef cow

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**0541 Effect of double ovulation on corpus luteum blood perfusion, peripheral progesterone, and hepatic steroid inactivating enzymes in dairy cattle.**

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Double ovulation is more common in Holstein cows than other dairy breeds. The effects of double ovulation on the corpus luteum (CL) and subsequent peripheral progesterone and clearance have not been examined. Thus, the objective of this experiment was to determine if induction of an accessory CL, via hCG, alters blood perfusion of CL, peripheral concentrations of progesterone, or hepatic steroid inactivating enzymes. Lactating, nonpregnant Holstein cows ( $n = 19$ ) were synchronized using Ovsynch. Seven days postovulation, 8 cows received an injection of hCG (1000 IU, i.m.) while 11 cows received no treatment. Size of CL were measured and photos of blood perfusion of CL were recorded (d 10 to d 18) via Doppler ultrasonography and a blood sample was collected daily. Picture images were analyzed visually by 2 consistent technicians, averaged, and categorized (0 to 9 with 0 = no perfusion and 9 = complete perfusion). Pictures were also assessed using ImageJ software for integrated density of pixels. On d 13 postovulation, a liver biopsy was performed

and hepatic steroid inactivating enzymes were analyzed. The MIXED procedure of SAS (SAS Inst. Inc., Cary, NC) was used with day as a repeated measure and cow as a random variable. LSM means and pooled SEM are presented. Cows with 1 or 2 CL had similar ( $P = 0.62$ ) peripheral concentrations of progesterone,  $7.2 \pm 0.7$  and  $7.7 \pm 0.8$  ng/mL, respectively. Compared with cows with 1 CL, cows with 2 CL had similar ( $P > 0.80$ ) volume ( $7.3 \pm 1.0$  vs.  $7.7 \pm 1.2$  cm<sup>3</sup>) but greater ( $P < 0.001$ ) total blood perfusion ( $3.8 \pm 0.3$  vs.  $6.9 \pm 0.3$  visual score;  $4403.7 \pm 641.3$  vs.  $7781.8 \pm 759.2$  pixels). Both visual and pixel perfusion scores adjusted for CL volume (per cm<sup>3</sup> of luteal tissue) were greater ( $P < 0.01$ ) in cows with 2 CL than 1 CL with a day  $\times$  treatment interaction. Hepatic enzyme (cytochrome P450 1A, 3A, and 2C, aldo-keto reductase 1C, and uridine diphosphate-glucuronosyltransferase) activities were not different ( $P > 0.23$ ) between treatment groups. Overall, the increased blood perfusion of CL in cows with 2 CL did not correspond to peripheral concentrations of progesterone or clearance as measured by hepatic enzyme activity, perhaps indicating that a double ovulation does not impact progesterone necessary to maintain pregnancy.

**Key Words:** blood perfusion, corpus luteum, progesterone

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**0542 A novel procedure using a gonadotropin-releasing hormone agonist to increase pregnancy rates in lactating dairy cattle.**

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An earlier postovulatory increase in circulating progesterone (P4) concentration is associated with greater pregnancy success, likely through P4 alteration of the uterine environment conducive for embryo survival. We have shown that chronic administration of a gonadotropin-releasing hormone (GnRH) agonist (Deslorelin; 1 µg/kg BW<sup>-1</sup> d<sup>-1</sup>) beginning d 3 of the estrous cycle increases mean and basal secretion of luteinizing hormone, size of the corpus luteum (CL), and circulating P4 concentrations in beef heifers. The objectives of the present studies were to increase circulating P4 concentrations and pregnancy rates in lactating dairy cows with chronic administration of Deslorelin. Luteal volumes and P4 concentrations were analyzed using a mixed model procedure with repeated measures. Pregnancy rates were analyzed using a Chi Square Analysis. Data were considered different at  $P < 0.05$ . Deslorelin treatment for 12 d (d 3 to 15; d 0 = estrus) increased CL volumes in primiparous lactating dairy cows ( $n = 4$ ) compared with untreated primiparous lactating dairy cows ( $n = 6$ ). Circulating P4 concentrations were increased in cows treated with Deslorelin as compared with controls. In a small pilot pregnancy study, cows of various parity received Deslorelin treatment for 7 d (d 3 to 10) or 12 d (d 3 to 15) following estrous synchronization and timed AI (d = 0). Pregnancy rates were

50% greater in cows treated with Deslorelin 7 d ( $n = 10$ ;  $P < 0.05$ ) compared with controls ( $n = 10$ ). No difference was observed in pregnancy rates for cows treated 12 d with Deslorelin ( $n = 10$ ) compared with controls. In summary, chronic administration of Deslorelin altered luteal volume and increased circulating P4 concentrations in primiparous lactating cows only, albeit not during the early postovulatory critical period. Chronic administration of Deslorelin for 7 d increased pregnancy rates in cows although no differences in circulating P4 concentrations were observed. None of the animals in these experiments exhibited insufficient luteal function as defined by circulating P4 concentrations  $< 1$  ng/mL; therefore, it is unlikely that the induced P4 concentrations by Deslorelin treatment resulted in increased pregnancy rates. These findings provide evidence that chronic administration of a GnRH agonist increases pregnancy rates in dairy cattle. The mechanism by which chronic administration of a GnRH agonist increases pregnancy rates is unknown, but could potentially be a direct effect of Deslorelin acting on the oviduct or uterine horn since GnRH receptors have been identified in bovine uterine tissue.

**Key Words:** dairy cow, gonadotropin-releasing hormone agonist, pregnancy rates

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#### 0543 Effect of an automated estrous detection system during a timed artificial insemination program on first postpartum artificial insemination.

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The aim of this study was to compare 2 reproductive programs for first AI based on activity monitors and timed AI (TAI). Seven-hundred-and-seventy-four lactating Holstein cows from 2 commercial farms (Farm A,  $n = 322$ ; Farm B,  $n = 452$ ) were enrolled. Animals were presynchronized with 2 injections of PGF followed by an ovsynch protocol. Treatments were (1) TAI: all first inseminations performed by timed AI, and (2) ACT: first insemination based on estrous detection by activity monitors (Heatime, SCR Engineering, Israel) after the presynchronization, whereas the remaining noninseminated cows were enrolled onto the ovsynch protocol. All animals had their body condition score (BCS, scale 1 to 5), hock score (HS, scale 1 to 4), gait score (GS, scale 1 to 4), and corpus luteum presence by ovarian ultrasonography recorded twice during presynchronization. Continuous data was analysed using ANOVA by PROC GLM whereas binomial data was analysed by logistic regression using PROC logistic of SAS (SAS Inst. Inc., Cary, NC). The ACT treatment had 52.3% of cows inseminated by estrous detection, whereas 90.3% of cows were bred by timed AI in the TAI treatment. Pregnancy per AI did not differ ( $P = 0.12$ ), and was 30.0 and 34.5% for ACT and TAI, respectively. Overall, pregnancy per AI was similar in cows bred by estrous detection compared with the ovsynch protocol (29.5 vs. 31.8%;

$P = 0.38$ ). Median days open was similar between treatments ( $P = 0.92$ ). From all cows inseminated on estrus, only 30.9 and 36.3% were considered lame (GS  $> 2$ ) and with a swollen hock (HS  $> 2$ ), respectively. Fertility was affected by foot and leg conditions as animals that were classified as being lame, with a swollen hock, or both, had decreased pregnancy per AI compared with healthy animals ( $P < 0.01$ ; 25.6 vs. 39.9%). The BCS did not affect the number of animals inseminated by estrous detection, but low BCS decreased pregnancy per AI ( $P < 0.01$ ; 23.9 vs. 38.9%). The proportion of noncyclic cows during the presynchronization that were inseminated on estrus was 38.7% compared with 54.9% in cyclic animals ( $P = 0.05$ ). In conclusion, pregnancy per AI did not differ between treatments; however, gait score, hock score, BCS and cyclic status highly impacted fertility and the number of animals detected in estrus. The use of activity monitors for automated estrous detection can be used strategically in a traditional reproductive program for first AI after calving.

**Key Words:** activity monitor, dairy cow, timed artificial insemination

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#### 0544 Effects of progesterone supplementation on reproductive responses in dairy cows subjected to timed artificial insemination programs: A meta-analysis.

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Objectives were to summarize the effects of progesterone supplementation during synchronization programs on pregnancy per AI (P/AI), and pregnancy loss in dairy cows through a meta-analysis. A systematic search for peer-reviewed manuscripts using Pubmed and ScienceDirect databases (Key Words: progesterone, dairy cow) yielded a total of 2384 results. Only controlled clinical trials were included ( $k = 16$ ), in which lactating dairy cows were either assigned to receive a single intravaginal device containing progesterone or remained as untreated controls subjected to the same timed AI (TAI) protocol. Studies were classified on whether cows received the first AI postpartum or subsequent AI (first, 2+, mixed), if presynchronization was performed, and if cows were observed for estrus and allowed to be inseminated before TAI. A subset of studies with cows classified based on presence of CL at the initiation of the TAI protocol ( $k = 10$ ) was used to assess the effects of progesterone supplementation according to CL status. First and second pregnancy diagnoses were performed on d 30 (27 to 150 d) and d 60 (41 to 150 d) after AI. Pregnancy loss was defined for cows that lost their pregnancies between d 30 and 60. Meta-analysis was conducted using the Metafor package for R. Study was considered random and moderator variables were included as fixed effects. Results were reported as adjusted relative risk (RR) and its 95% confidence interval. Pregnancy loss and P/AI were calculated from raw data.

Overall, progesterone supplementation increased ( $P = 0.003$ ) P/AI on d 60 (RR = 1.19; 95%CI = 1.07–1.32; P/AI: 33.3 vs. 28.6%). Presynchronization of the estrous cycle and AI number did not impact the benefit from progesterone supplementation and accounted for 6.9 and 6.0% of the heterogeneity, respectively. Allowance for AI at detected estrus accounted for 47.4% of the heterogeneity and reduced ( $P = 0.01$ ) the benefit from progesterone supplementation compared with TAI only (RR = 0.81; 95%CI = 0.68 to 0.95; P/AI supplemented vs. control: estrus-AI or TAI = 32.6 vs. 30.2%, TAI = 34.5 vs. 25.9%). Progesterone supplementation tended to reduce ( $P = 0.09$ ) pregnancy loss (RR = 0.82; 95%CI = 0.66 to 1.02; pregnancy loss: 10.9 vs. 13.0%); all heterogeneity was explained by AI number as supplementation reduced pregnancy losses in cows receiving first postpartum AI (10.1 vs. 14.0%) but not subsequent AI (11.8 vs. 12.0%). Subgroup analyses depicted that the benefit of progesterone supplementation on P/AI at 60 d and pregnancy loss were not affected by CL status. In conclusion, progesterone supplementation improved fertility mainly in cows not detected in estrus during the TAI program.

**Key Words:** dairy cow, progesterone, meta-analysis

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#### 0545 Regimens of progesterone supplementation for lactating dairy cows according to the presence of corpora lutea at the initiation of the timed artificial insemination program. R. S. Bisinotto\*,

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Objectives were to evaluate the effects of supplemental progesterone on fertility of dairy cows according to the presence of corpora lutea (CL) at the initiation of the Ovsynch-56 program (d-10 GnRH, d 3 PGF<sub>2α</sub>, h 16 GnRH, d 0 AI). Cows had their ovaries evaluated by ultrasonography (d 10) and those without CL were assigned randomly to receive 0 (NoCL;  $n = 558$ ) or 2 intravaginal inserts containing progesterone (CIDR) from d 10 to d 3 (2CIDR;  $n = 544$ ). Cows with CL on d 10 were matched by pen and used as positive controls (Diestrus;  $n = 543$ ). The remaining cows bearing CL were assigned randomly to receive 0 (Control;  $n = 388$ ) or 1 CIDR inserts (1CIDR;  $n = 393$ ). Ovaries were scanned on d 3 for assessment of ovulation after the first GnRH and the presence of a newly formed CL. A subgroup of cows ( $n = 365$ ) had their ovaries scanned on d 1 and d 1 for measurement of the ovulatory follicle and evaluation of the response to the second GnRH. Estrus was detected based on removal of tail chalk beginning on d -10. Pregnancy was evaluated 32 and 60 d after AI. Data were analyzed using the GLIMMIX procedure of SAS (SAS Inst. Inc., Cary, NC). A greater ( $P < 0.01$ ) proportion of NoCL and 2CIDR cows had a new CL on d -3 compared with Diestrus (71.6, 68.7, 43.2%), whereas no difference was observed between Control and 1CIDR (51.2,

56.6%). Fewer ( $P < 0.01$ ) NoCL and 2CIDR cows had CL on d -3 compared with Diestrus (71.6, 68.7, 88.0%) and no difference was observed between Control and 1CIDR (86.4, 87.6%). Progesterone supplementation reduced ( $P = 0.05$ ) the proportion of cows without CL inseminated before timed AI for first postpartum AI (2CIDR = 10.9, NoCL = 17.7%), but not for subsequent AI (2CIDR = 19.0, NoCL = 17.5%) or cows with CL (1CIDR = 7.8, Control = 9.1%). Ovulation to the second GnRH was not affected by treatment and averaged 86.5%. The diameter of the ovulatory follicle tended to be reduced ( $P = 0.07$ ) by progesterone supplementation in cows lacking CL (2CIDR =  $17.0 \pm 0.4$ , NoCL =  $18.1 \pm 0.4$  mm), but not in those with CL (1CIDR =  $17.5 \pm 0.4$ , Control =  $17.8 \pm 0.4$  mm). Pregnancy per AI was greater ( $P \leq 0.08$ ) for 2CIDR compared with NoCL, and intermediate for Diestrus on d 32 (38.4, 32.7, 35.9%) and 60 (33.3, 28.3, 31.4%). This benefit was observed exclusively in cows not detected in estrus at AI. Progesterone supplementation reduced ( $P = 0.05$ ) P/AI in 1CIDR compared with Control on d 32 (38.3, 45.7%) but not on d 60 after AI (33.4, 37.4%), which was associated with smaller ( $P = 0.04$ ) pregnancy loss in the 1 CIDR group (4.0, 12.6%).

**Key Words:** anovulation, dairy cow, progesterone

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#### 0546 Effect of preovulatory concentration of estradiol and length of proestrus on pregnancy rate to timed-artificial insemination and embryo transfer in beef cows. L. H. Cruppe\*<sup>1</sup>,

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Postpartum beef cows ( $n = 327$ ) were used to investigate the effect of preovulatory estradiol concentration (Pre-E2) and length of proestrus on timed-AI (TAI) and embryo transfer (ET) pregnancy rates. Ovulation was presynchronized with the 5-d CO-Synch + CIDR (controlled internal drug release device), follicle aspiration performed 6.5 d later (d -7 of experiment) and cows received 50 mg PGF<sub>2α</sub> on either d -3 (normal estradiol treatment; HiE), or on d -1.5 (deficient estradiol treatment; LoE). All cows received 100 µg GnRH on d 0, creating a proestrus of either 3 or 1.5 d. Ultrasonography was performed on d -7, 0, and 7 to confirm ovulation to pre-synchronization, ovulatory follicle diameter and corpus luteum (CL) formation after GnRH, respectively. Blood samples on d -3, -1.5 and 0 were used to determine Pre-E2. Blood samples on d -3, d 0, and d 7 were analyzed for progesterone to confirm presence of CL, its regression and formation of new CL, respectively. Cows in the HiE and LoE treatments were either TAI on d 0 or ET on d 7, resulting in 4 distinct combinations (HiE-AI,  $n = 77$ ; HiE-ET,  $n = 67$ ; LoE-AI,  $n = 98$ ; LoE-ET,

$n = 85$ ) in a  $2 \times 2$  factorial arrangement. Pregnancy diagnosis was performed on d 35. Ovulatory follicle diameter ( $11.9 \pm 0.1$  mm) and progesterone on d -3 ( $3.8 \pm 0.1$  ng/mL), d 0 ( $0.4 \pm 0.0$  ng/mL) and d 7 ( $2.6 \pm 0.1$  ng/mL) did not differ among treatments. As expected, Pre-E2 on d -3 was similar between HiE ( $4.5 \pm 0.1$  pg/mL) and LoE ( $4.5 \pm 0.1$  pg/mL). In contrast, Pre-E2 was greater ( $P < 0.05$ ) in the HiE on d -1.5 and 0 ( $7.6 \pm 0.2$ ;  $10.1 \pm 0.3$  pg/mL, respectively) compared with LoE ( $5.1 \pm 0.2$ ;  $9.2 \pm 0.2$  pg/mL, respectively). Pregnancy rate was greater ( $P < 0.05$ ) in the HiE treatment and AI group (HiE-AI, 68.8%; HiE-ET, 52.2%; LoE-AI, 46.9%; LoE-ET, 37.6%) compared with the LoE treatment and ET group, however no

interaction treatment (HiE/LoE) and breeding technique (AI/ET) was detected for pregnancy rate. Reduced Pre-E2 was the primary outcome of shortened proestrus, which resulted in similar reductions in TAI (31.8%) and ET (28.0%) pregnancy rate; relative to that achieved in the Hi-E treatment. Based on the similarity of these responses, it is concluded that the primary impact of deficient Pre-E2 is to impair the ability of the uterus to sustain the embryo during early gestation.

**Key Words:** preovulatory estradiol, timed artificial insemination, embryo transfer