Physiology and Endocrinology: Reproductive Management

M299 Effect of prepartum somatotropin on milk production, metabolism and reproduction in primiparous Holstein dairy cows. A. Schneider*, E. Schwegler, P. Montagner, L. T. Hax, M. M. Antunes, E. Schmitt, F. A. B. Del Pino, I. Bianchi, and M. N. Corrêa, *Federal University of Pelotas*, *Pelotas, RS, Brazil*.

The aim of this work was to evaluate the effect of prepartum somatotropin (bST) injection on metabolic adaptation and resumption of ovulatory cycles in primiparous dairy cows. For this study 31 primiparous Holstein cows in a commercial dairy herd were used. The cows had a mean body weight (BW) of 568.8 ± 47.8 kg and 3.4 ± 0.4 of body condition score (BCS) at the beginning of the experiment. Cows in the bST group (n = 15) received subcutaneous injections of bST (500 mg, Boostin) at −32.2 ± 6.9 d and −18.9 ± 6.9 d, and, if pertinent, at −4.7 ± 7.1 d from calving date. Control cows (n = 16) did not receive any treatment and were managed in the same conditions of treated cows. Blood samples were collected weekly from −35 d to 45 d after calving for glucose, non-esterified fatty acids (NEFA), insulin-like growth factor I (IGF-I) and progesterone assays. Postpartum cows were milked twice daily and production was recorded. A cow was considered ovulated when blood progesterone exceeded 1 ng/mL after calving. Data was compared between groups by ANOVA for repeated measures. Ovulatory status was compared among groups by the Chi-squared test. A value of $P < 0.05$ was considered significant. The positive effect of prepartum bST on milk production and resumption of ovulation could be related to the better adaptation, as seen by the reduced postpartum BCS loss, and, also to the exposure of mammary and reproductive tissues to higher IGF-I concentrations. In conclusion, prepartum somatotropin injection reduced BCS loss, percentage of anovulatory cows, and improved milk production during the first 45 DIM.

Table 1. Variables analyzed for control and prepartum somatotropin treated (bST) groups

	Treatment			P
Variables	Control	bST	SEM	Treat
Prepartum				
BW, kg	568.7	559.7	6.4	0.32
BCS	3.1	3.2	0.0	0.36
Glucose, mmol/L	3.1	3.0	0.1	0.85
NEFA, mmol/L	0.9	1.0	0.0	0.004
IGF-I, ng/mL	84.1	127.8	7.3	<0.0001
Postpartum				
BW, kg	532.9	524.7	4.7	0.22
BCS	2.6	2.8	0.0	<.0001
Glucose, mmol/L	3.2	3.2	0.1	0.49
NEFA, mmol/L	0.9	0.9	0.0	0.28
Milk production, kg/day	22.6	25.3	0.5	<0.0001
Anovulatory at 45 DIM, %	62.5	20.0	-	0.016

Key Words: dairy cows, prepartum bST, postpartum ovulation

M300 Effect of dietary energy on ovarian development and fertility in postpuberal beef heifers. S. E. Echternkamp*, R. A. Cushman, and C. L. Ferrell, *USDA, ARS, U.S. Meat Animal Research Center*, *Clay Center, NE*.

Beef producers are advised to develop replacement heifers to 65% of mature BW, but reports indicate this BW could be reduced to lower input costs. To determine whether lower dietary intake impedes ovarian development and fertility in purebred or crossbred heifers, Angus (n = 60) and MARC II (1/4 Angus, 1/4 Hereford, 1/4 Gelbvieh, and 1/4 Simmental; n = 60) heifers were fed either a high (HE) or low (LE) energy diet for 180 d postweaning to achieve 65 vs. 53% of mature BW at first breeding. At 14 mo of age, heifers were housed with fertile bulls for 47 d. Estrus was monitored for 21 d, and 12 h after estrus, ovaries were ultrasounded in one-half of the heifers to measure ovarian length and height, preovulatory follicle diam., and total number of antral follicles (AFC); corpus luteum (CL) diam. and blood progesterone were measured 7 to 14 d after estrus. Data were analyzed by SAS PROC GLM or GLIMMIX with diet and genetic line as independent variables; 2-way interactions were not significant. Initial BW (282.8 kg) did not differ but, at breeding, HE heifers were heavier (429.4 vs. 344.8 ± 7.1 kg) and fatter (6.9 vs. 5.0 ± 0.1 BCS) than LE heifers ($P < 0.01$); experimental ADG was 0.81 vs. 0.35 ± 0.02 kg/d ($P < 0.01$). Puberty occurred in 93.3% of heifers prebreeding. Size of preovulatory follicle (13.7 ± 0.2 mm), ovary (length = 24.2 ± 0.3 mm; height = 13.3 ± 0.2 mm), CL (19.4 ± 0.5 mm), and AFC (23.4 ± 1.3) did not differ between HE and LE, but follicle diam. (14.3 vs. 13.1 ± 0.3 mm; $P < 0.01$) and ovarian length (25.1 vs. 23.1 ± 0.7 mm; $P = 0.05$) were greater for MARC II vs. Angus heifers. Ovarian size was correlated with AFC (r = 0.64; $P < 0.01$). Plasma progesterone was greater for HE vs. LE heifers (5.3 vs. 4.3 ± 0.3 ng/mL; $P < 0.05$), but CL diam. (19.4 ± 0.5 mm) was not affected by diet or line. Pregnancy rate did not differ between diets but tended ($P = 0.07$) to be greater for MARC II vs. Angus (80 vs. 65%). Developing yearling beef heifers to 53% of mature BW did not impede ovarian development or heifer pregnancy rate.

Key Words: beef heifers, diet, fertility

M301 The pH decreases in the vaginal portion of the cervix in mares near ovulation. J. J. Parrish*, *University of Wisconsin*, *Madison*.

The objective was to determine if vaginal pH in mares varies during the estrous cycle and could be a predictor of time to breed. In this study, wireless transmitting boluses were obtained from Kahne Limited, New Zealand, that were capable of measuring pH, temperature and pressure. Boluses of 15 × 3 cm, were originally designed for remote rumen measurements but modified in our lab for limited time use in mares. The boluses were sterilized in Nolvasan followed by rinsing in distilled water and calibration with pH standards. The mare's vulva was disinfected with 3 washes of detergent as done for artificial insemination. The bolus was inserted with a lubricated gloved hand into the vagina. The tip of the bolus was inserted deep into the anterior vagina and into the folds of the vaginal portion of the cervix. This location was chosen as air entering the vagina produced unstable pH readings when the bolus was left in just the anterior vagina. Pressure measurements demonstrated the vagina was 10 mbar below ambient pressure and influx of air occurred at unpredictable times. The pH was recorded at 5 s intervals and the average pH determined over a mean ± SEM of 4.1 ± 0.3 min (225 measurements) per mare. Data was obtained on 3 mares on days −7, −2, −1 and 0 relative to ovulation as detected via ultrasonography. Mares exhibited estrus on days −2, −1 and 0. The mean ± sem pH across mares was 7.02

± 0.01, 6.95 ± 0.02, 6.88 ± 0.02, and 6.75 ± 0.07 for days −7, −2, −1 and 0 respectively. Using Dunnett's procedure, days −7 and −2 had greater pH values than d 0 ($P < 0.05$) but d 0 was not different from day −1 ($P > 0.05$). Temperature measured along with pH did not vary over stage of cycle ($P > 0.05$). If left in the vagina overnight, the boluses were ejected at 12 – 24 h and often damaged. Vaginal pressure changes were detected when an estrus mare was brought into contact with a stallion. The experiment demonstrated that the pH of the vaginal portion of the cervix in mare's is neutral in diestrus and decreases near the time of ovulation and thus could be a suitable marker of the time to breed. The boluses were the generous donation of Kahne Limited.

Key Words: vaginal pH, estrous cycle, ovulation

M302 Main endocrine-metabolic differences between 1st and 2nd lactation of the dairy cows around calving. G. Bertoni*, R. Lombardelli, F. Piccioli-Cappelli, and E. Trevisi, *Istituto di Zootecnica, Universitá Cattolica S. Cuore*, *Piacenza, Italy*.

Dairy cows yield less milk in the 1st lactation in comparison to the following one and this seems to be mainly due to mammary gland development, although other factors can be involved (e.g., level of DMI, digestive tract development, different experience of stress). With the aim to better clarify the influence of metabolic-endocrine changes on differences in milk yield between 1st (L1) and 2nd (L2) lactation, 8 healthy Italian Frisian cows reared under very similar conditions (housing, diet, climate), were checked in their first 2 lactations. Cows were individually fed with corn silage, chopped alfalfa and grass hays distributed every 12 h, and concentrate, fed in 2 (dry period) or 8 (lactating period) meals at regular intervals. Cows have been daily checked for milk yield, DMI, and fortnightly for BW and BCS. Blood samples were weekly withdrawn, before the morning meal, from −28 to 120 DIM to determine metabolites and hormones. During 1st month of lactation, L2 showed higher milk yield (40.0 vs. 30.8 kg/d), DMI (20.5 vs. 17.9 kg/d) and lower BCS (2.36 vs. 2.49 score). The negative energy balance was more accentuated in L2 as suggested by the lower glucose for 3 weeks (3.43 vs. 3.78 mmol/L; $P < 0.01$) and higher BHBA (0.64 vs. 0.89 mmol/L; $P < 0.05$), despite NEFA were similar. Hormones with an apparent relationship with lactation start were bST and glucagon (increased) and IGF-I, insulin and perhaps triiodothyronine (T3) (reduced); nevertheless, in the periparturient period very small differences has been observed, according to parity, for bST, glucagon and T3. Otherwise, the average values (end pregnancy - first two months of lactation) were lower in L2 for insulin (5.9 vs. 7.6 mcU/mL; $P < 0.01$) and IGF-I (47 vs. 63 ng/mL; $P < 0.01$). These last differences suggest that the more negative energy balance of L2, due to higher milk yield, is the main cause of lower glucose and, consequently, of lower insulin and IGF-1. This explanation seems confirmed by the good correlation between glucose recovery and that of insulin and IGF-1 in the 1st month of lactation. To conclude, higher milk yield in the 2nd lactation does not seem to be affected by hormonal changes, but it indirectly causes a reduction of insulin and IGF-1.

Key Words: milk yield, parity, hormone

M303 Effect of thermal preconditioning during the prebreeder period on breeder turkey hens' reproductive performance. S. W. Kang*, S. Kosonsiriluk, S. J. Welch, and M. E. El Halawani, *University of Minnesota*, *St. Paul*.

Breeder turkey hens photostimulated in the month of May are highly susceptible to a sudden increase in environmental temperature which has a detrimental effect on egg production. The objective of this study was to investigate the effects of thermal preconditioning before photostimulation on enhancing egg production during the summer months. Hens were reared under the photoperiod 14L/8D daily with day length reduced to 6L/18D from 17 to 30wk. At 30wk, hens were photostimulated (15L/9D). In experiment 1: Hens were subjected to temperature treatments at 20 wks of age (6hrs/day). Treatments included: 1) Control, no temperature treatment. 2) 10 wks: subjected to 75°F, increasing by 5°F every 2 wks. 3) 5 wks: same as treatment (2) excepting each temperature cycle was only for one wk. 4) 3 wks: treatment started at 27 wk, starting at 85°F, increasing by 5°F for the next 2 wks. In experiment 2: Treatments included: 1) Control, same as experiment 1. 2) 3wks: subjected to 85°F at 27 wk, increasing by 5°F every wk. 3) 2 wks: subjected to 90°F at 28 wk, increasing by 5°F at 29 wk. 4) 1 wk: subjected to 95°F at 29 wk. Peak egg production was comparable among all treatment groups between wk 1–4 of photostimulation. In experiment 1, average egg production was highest in the 3 wks preconditioning group (4.16 eggs/hen/wk) during the 27 wks production period. Lowest average egg production was that of hens receiving 10 wks of preconditioning (3.43 eggs/hen/wk). Control group was 3.86 eggs/hen/wk. In experiment 2, average egg production of the 1 wk preconditioning group (3.96 eggs/hen/wk) was 37.5% higher than that of control (2.88 eggs/hen/wk). There was no significant difference among treatment groups (1, 2, and 3 wks). The results clearly indicate that thermal preconditioning can be beneficial or detrimental to egg production of hens photostimulated in the month of May depending on the preconditioning temperature schedule and age of hens at the time of treatment initiation.
Supported by Minnesota Turkey Growers Association, Willmar Poultry Co., and Minnesota Agricultural Experiment Station.

Key Words: turkey reproductive performance, heat stress, thermal preconditioning