J. Dairy Sci. 99:2353–2357
http://dx.doi.org/10.3168/jds.2015-10159

Short communication: Plasma progesterone concentration and ovarian dynamics of lactating Jersey cows treated with 1 or 2 intravaginal progesterone inserts

João G. N. Moraes,*[1] Paula R. B. Silva,* Nathália Bortoletto,† Alexandre L. A. Scanavez,† and Ricardo C. Chebel†‡[2]
*Department of Veterinary Population Medicine, University of Minnesota, Saint Paul 55108
†Department of Large Animal Clinical Sciences, and
‡Department of Animal Sciences, University of Florida, Gainesville 32608

ABSTRACT

The objectives of the current experiment were to determine circulating progesterone concentrations and ovarian follicle development of lactating Jersey cows treated with 1 or 2 controlled internal drug release (CIDR) insert containing 1.38 g of progesterone during proestrus. Cows were enrolled in the experiment at 34 ± 3 d in milk and were paired by parity, body condition score, body weight, and milk yield. Estrous cycles were presynchronized with an injection of GnRH concurrent with a new CIDR insert (study d −7) and 2 injections of $PGF_{2\alpha}$ given 5 and 6 d after the GnRH injection (study d −2 and −1, respectively). Cows assigned to the 1CIDR treatment (n = 30) or 2CIDR treatment (n = 30) received 1 and 2 CIDR inserts, respectively, from study d 0 through 7. Control cows (n = 10) did not receive further treatment. On study d −2 and daily from study d 0 through 7, ovaries were examined by transrectal ultrasound and blood samples were collected for determination of progesterone. On study d 7, CIDR inserts were removed after ultrasound exam and blood sample collection. Progesterone concentration from study d 0 through 7 was greatest for 2CIDR cows (2.17 ± 0.09 ng/mL), followed by 1CIDR cows (1.37 ± 0.10 ng/mL) and control cows (0.62 ± 0.21 ng/mL). The interaction between treatment and study day affected progesterone concentration from study d 0 through 7. The average increase in progesterone concentration from study d 1 through 7 was 0.80 ng/mL for 1CIDR and 1.72 ng/mL for 2CIDR cows compared with control cows. The percentage of cows that ovulated between study d 0 and 7 was greatest for control cows (80%), but it did not differ between 1CIDR (12%) and 2CIDR (3.7%) cows. Growth of class III follicles (10–17 mm) identified on study d 0 was affected by treatment because 1CIDR cows had larger class III follicles than 2CIDR cows on study d 5, 6 and 7. A larger proportion of control cows developed a new follicular wave between study d 0 and 7 (control = 60.0%, 1CIDR = 12.0%, 2CIDR = 7.4%). Treatment of lactating Jersey cows with 1 and 2 CIDR inserts resulted in a 1 and 2 fold increase, respectively, in circulating progesterone concentration. Growth class III follicles from cows treated with 2 CIDR inserts was reduced compared with untreated cows and cows treated with 1 CIDR insert.

Key words: lactating Jersey cow, intravaginal progesterone insert, plasma concentration, follicle development

Short Communication

A shift in the breed composition of the US dairy herd, with increasing numbers of Jersey animals (NAHMS, 2007), may be attributed to increased market interest in milk solids rather than fluid milk. Although several studies have evaluated different reproductive strategies for lactating Jersey cows, the effects of controlled internal drug release (**CIDR**) insert treatment containing 1.38 g of progesterone on circulating concentrations of progesterone and follicular development have not been reported in lactating Jersey cows. Treatment of Holstein cows with 1 new CIDR insert results in a 0.78-ng/mL increase in circulating progesterone concentration (Cerri et al., 2009), which is insufficient to improve fertility of cows not bearing a functional corpus luteum (**CL**; Rivera et al., 2011; Denicol et al., 2012). Treatment of lactating cows with 1 CIDR insert may not improve embryo viability because the small increase in progesterone concentration resulting from CIDR treatment may result in increased LH pulsatility during follicle development, which is believed to result in faster follicle development and compromised oocyte quality (Cerri et al., 2009).

Received July 22, 2015.
Accepted October 26, 2015.
[1]Current address: Department of Animal Sciences, University of Missouri, Columbia, MO, 65211.
[2]Corresponding author: rcchebel@ufl.edu

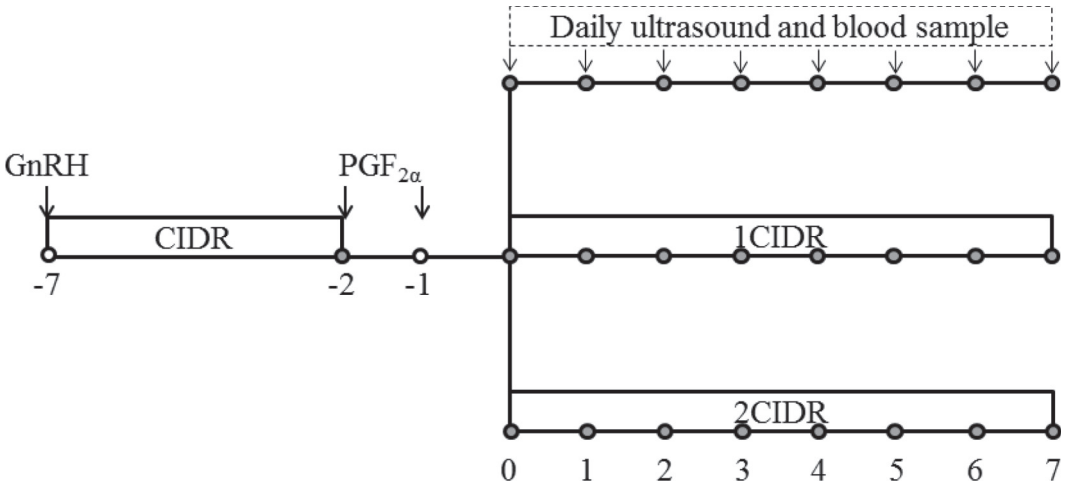

Figure 1. Diagram of activities. Estrous cycles were presynchronized with an injection of 100 μg of GnRH (gonadorelin diacetate tetrahydrate; 2 mL of Cystorelin; Merial Ltd., Iselin, NJ) concurrent with a new controlled internal drug release (CIDR) insert (Eazi-Breed CIDR Cattle Insert; Zoetis Animal Health, Madison, NJ) on study d −7, and 2 injections of 25 mg of $PGF_{2\alpha}$ (dinoprost tromethamine, 5 mL of Lutalyse sterile solution; Zoetis Animal Health) given on study d −2 and −1. Cows assigned to the 1CIDR treatment (n = 30) received 1 new CIDR insert from study d 0 through 7, cows assigned to the 2CIDR treatment (n = 30) received 2 new CIDR inserts from study d 0 through 7, and control cows (n = 10) did not receive further treatments. Grey circles represent ultrasound (5 MHz, Ibex Lite, E. I. Medical Imaging, Loveland, CO) exam of ovaries and blood sample collection for determination of progesterone concentration.

The hypothesis of the current experiment was that treatment of Jersey cows with 1 CIDR insert would result in an increase in progesterone concentration of 0.6 to 0.8 ng/mL, whereas treatment of Jersey cows with 2 CIDR inserts would result in an increase in progesterone concentration of approximately 1.6 to 2.0 ng/mL. This hypothesis was based on previously published work with Holstein cows treated with 1 CIDR insert (Cerri et al., 2009). Another hypothesis of the current experiment was that growth of follicles of Jersey cows treated with 1 or 2 CIDR inserts would be reduced compared with untreated Jersey cows. Therefore, the objectives of the current experiment were to determine circulating progesterone concentrations and follicular growth of lactating Jersey cows treated with 1 or 2 CIDR insert containing 1.38 g of progesterone during proestrus.

The experiment was conducted in a cross-ventilated freestall commercial dairy farm located in south-central Minnesota during the month of October 2010. Cows at 34 ± 3 DIM were balanced for parity, BCS, BW, and milk yield in the first month of lactation and allocated randomly to 1 of 3 treatments. For every cow allocated to the control (n = 10), 3 cows were allocated to a treatment receiving 1 insert (**1CIDR**; n = 30) and 3 cows were allocated to a treatment receiving 2 inserts (**2CIDR**; n = 30). Body condition was scored in a scale from 1 (thin) to 5 (obese) according to (Ferguson et al., 1994) and BW was determined using heart girth circumference weight tapes for Jersey cows (The Coburn Company Inc., Whitewater, WI). Estrous cycles were presynchronized with an injection of 100 μg of GnRH (gonadorelin diacetate tetrahydrate; 2 mL of Cystorelin; Merial Ltd., Iselin, NJ) concurrent with a new CIDR insert (Eazi-Breed CIDR Cattle Insert; Zoetis Animal Health, Madison, NJ) on study d −7, and 2 injections of 25 mg of $PGF_{2\alpha}$ (dinoprost tromethamine, 5 mL of Lutalyse sterile solution; Zoetis Animal Health, Madison, NJ) given on study d −2 and −1. Cows assigned to the 1CIDR treatment received 1 new CIDR insert from study d 0 through 7, cows assigned to the 2CIDR treatment received 2 new CIDR inserts from study d 0 through 7, and control cows did not receive further treatments (Figure 1).

Ovaries were examined by transrectal ultrasound (5 MHz, Ibex Lite, E. I. Medical Imaging, Loveland, CO) on study d −2 for the presence of a dominant follicle (≥10 mm) and corpora lutea, and daily from study d 0 through 7 for measurement and mapping of ovarian structures (follicles ≥3 mm and corpora lutea). On study d 0, ovarian follicles were categorized according to their diameter as class I (≤4 mm), class II (5–9 mm), class III (10–17 mm), and class IV (≥18 mm). Ovulation was inferred when a large follicle (>10 mm) was observed in 1 ultrasound exam and was not observed in 2 consecutive ultrasound exams thereafter. Interval from study d −2 to ovulation was inferred as being the 12 h after the last ultrasound exam in which the follicle was observed. A new follicular wave was characterized by the identification and continued growth (observed