

Effect of supplemental progesterone during follicle growth on fertility of dairy cows without a corpus luteum

Rafael S. Bisinotto and José E.P. Santos

Department of Animal Sciences, University of Florida, Gainesville, FL

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Anovular dairy cows and those without a corpus luteum (CL) have marked depression in pregnancy per artificial insemination (P/AI), 12 to 15 percentage units (e.g. 42 vs. 28% P/AI) compared with cyclic cows that develop the ovulatory follicle during diestrus. We have shown that lack of adequate concentrations of progesterone during follicle growth impairs fertility in this cohort of cows, which represents 25 to 30% of all inseminated cows. Two experiments funded by the Southeast Milk Inc. Dairy Checkoff program were conducted to determine the effects of supplementing progesterone during follicle growth on fertility responses in dairy cows.

In experiment 1 (Bisinotto et al., 2013), Holstein cows were subjected to the 5-d timed AI program (day -8 GnRH, days -3 and -2 PGF_{2α}, day 0 GnRH and AI). Cows had their ovaries scanned by ultrasonography on day -8 and those bearing a CL were considered to be in diestrus (**Diestrus**, n = 946). Cows that lacked a CL on day -8 were assigned to remain as untreated control (**Control**; n = 234) or receive two controlled internal drug-release (**CIDR**) inserts containing progesterone (**2CIDR**, n = 218) from day -8 to -3. Blood was analyzed for progesterone concentrations. Pregnancy was diagnosed on days 34 and 62 after AI. Progesterone concentrations during the timed AI program were lowest for Control, intermediate for 2CIDR and highest for Diestrus. Supplementation increased progesterone concentrations between days -7 and -3 compared with Control (2.65 vs. 0.51 ng/mL). Pregnancy per AI was less for Control compared with 2CIDR or Diestrus on day 32 (30.8 vs. 46.8 vs. 49.9%) and 64 (28.6 vs. 43.7 vs. 47.3%), indicating that supplementation with progesterone re-established fertility in cows lacking a CL on day -8.

In experiment 2 (Bisinotto et al., 2015), Holstein cows from five commercial dairy farms were subjected to the Ovsynch-56 protocol (day -10 GnRH, day -3 PGF_{2α}, day -0.7 GnRH, day 0 AI). Ovaries were scanned by ultrasonography on day -10. Within farm, cows without CL were assigned randomly to remain as non-supplemented controls (**Control**; n = 652) or to receive two CIDR inserts from day -10 to day -3 (**2CIDR**, n = 642). Cows with CL were used as positive controls (**Diestrus**; n = 640). Blood was sampled and analyzed for progesterone concentrations. Pregnancy was diagnosed on days 32 and 60 after AI. The average progesterone concentration during the timed AI was lowest for Control, intermediate for 2CIDR, and highest for Diestrus (0.92, 2.77, and 4.93 ng/mL). Pregnancy per AI was less for Control compared with 2CIDR and Diestrus on day 32 (31.3, 42.2, and 38.4%, respectively) and 60 after AI (28.9, 37.2, and 33.9%, respectively). Further analyses indicated that a minimum of 2.0 ng/mL of plasma progesterone was needed to optimize fertility. A single ultrasound examination effectively identified a low-fertility cohort of cows based on the absence of CL at the first GnRH injection of the Ovsynch protocol. Supplementation with two CIDR inserts increased progesterone in plasma and restored fertility in dairy cows lacking CL similar to that of cows in diestrus.

Bisinotto et al. (2013) J. Dairy Sci. 96:2214-2225

Bisinotto et al. (2015) J. Dairy Sci. 98:2515-2528