How Does Porcine Luteinizing Hormone Increase Pregnancy Rates in Dairy Cows?

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The use of porcine luteinizing hormone (pLH) in lieu of gonadotropin-releasing hormone (GnRH) for synchronizing ovulation in a timed-artificial insemination protocol improved pregnancy rates (42 vs. 28%) in dairy cows, without increasing post-ovulation progesterone concentrations (Colazo et al., 2009; Theriogenology 72:262-270). Luteinizing hormone (LH) profiles are known to differ between GnRH- and pLH-treatments, but the mechanisms associated with the increase in pregnancy rates in pLH-treated cows remains unknown. We hypothesized that pLH treatment favourably alters the expression of intrafollicular proteins associated with improved oocyte (egg) competence and fertility. To test this hypothesis, we examined the expression of bone morphogenetic protein-15 (BMP-15), growth differentiation factor-9 (GDF-9) and transforming growth factor-beta1 (TGF-β1) in the follicular fluid of cyclic non-lactating Holstein cows. Follicular fluid was aspirated from preovulatory follicles by a transvaginal ultrasound-guided procedure 21 ± 1 h after treatment of either 25 mg pLH (n = 8) or 100 µg GnRH (n = 6) IM. In GnRH-treated cows, mean (± SE) plasma LH (ng/mL) increased from 0.4 ± 1.3 to a mean peak of 14.3 ± 1.3 by 1.5 h and returned to baseline concentration by 8 h after treatment. In pLH-treated cows, plasma LH increased from 0.2 ± 0.2 to a mean peak of 2.1 ± 0.2 by 1.5 h and remained higher ($P < 0.001$) than basal concentrations up to 20 h after treatment. Relative abundance of BMP-15, GDF-9 and TGF-β1 proteins were approximately 2- fold greater ($P < 0.05$) in the follicular fluid of cows treated with pLH, supporting our hypothesis. Our findings indicate that preovulatory follicles in pLH-treated cows were exposed to a prolonged LH profile and this was associated with a greater abundance of oocyte-derived factors in follicular fluid.

Interpretation: The higher levels of BMP-15, GDF-9 and TGF-β1 in pLH-treated cows observed in this study may explain the higher pregnancy rates previously reported by Colazo et al. (2009).

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