

Monitoring in-line milk progesterone profiles prior to first breeding to predict reproductive performance of Holstein cows

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The in-line milk analysis system (IMAS) is an automated biosensor technology that quantifies milk progesterone concentrations (P4c) at frequent intervals starting early postpartum until pregnancy. We investigated if postpartum milk P4c profiles, determined by an IMAS (Herd Navigator™, DeLaval Inc.), could be used to predict subsequent reproductive performance in Holstein cows. Specifically, we evaluated associations of (1) interval from calving to onset of cyclicity, (2) length of first postpartum luteal phase, (3) first P4c peak, and (4) number of luteal phases prior to first breeding, with the probability of pregnancy at first AI and cumulative proportion of pregnant cows by 150 DIM. Milk P4c (ng/mL) were measured approximately every 2 d from 21 DIM until pregnancy in 1,354 lactations (1,190 cows) from 3 herds. Variations in P4c were used to define onset of cyclicity (first increase in P4c to ≥ 5 ng/mL), length of the first luteal phase (period of P4c ≥ 5 ng/mL during the first cycle), and pregnancy (P4c increased to ≥ 5 ng/mL after AI and remained above the threshold until 55 d after AI). All AI occurred within 5 d after a decline in P4c (< 5 ng/mL), as per manufacturer's recommendation. First AI occurred at 70 ± 17 DIM, and overall probability of pregnancy at first AI and by 150 DIM were 25.6 and 62.3%, respectively. Parameters negatively associated with the probability of pregnancy at first AI were: delayed onset of cyclicity after 49 DIM ($P = 0.09$); prolonged first luteal phase (greater than 12 d in length; $P = 0.04$); sub-optimal first P4c peak (less than 17 ng/mL; $P < 0.01$); and having only one vs. two luteal phases prior to first AI ($P < 0.01$). Similarly, the likelihood of being pregnant by 150 DIM was decreased in cows that had a delayed onset of cyclicity (after 49 DIM; $P < 0.01$), in cows with a prolonged first luteal phase (greater than 17 d in length; $P < 0.01$), and in cows with only one luteal phase prior to first AI ($P < 0.01$).

Take Home Message: Monitoring milk progesterone profiles prior to first AI, as assessed by an in-line milk analysis system, can be helpful to identify cows that might have reduced fertility. Such information can be used by farmers to select cows for strategic interventions prior to first insemination, thereby improving their reproductive performance.