

Validating an in-line milk analysis system (Herd Navigator™) to diagnose pregnancy in dairy cows.

T.C. Bruinje,¹ and D.J. Ambrose,^{1,2}

¹ AFNS, University of Alberta, Edmonton, AB, T6G 2P5

² Livestock Research Branch, Alberta Agriculture and Forestry, Edmonton, AB, T6H 5T6.

E-mail: tcbruinje@ualberta.ca

The in-line milk analysis system (IMAS; Herd Navigator™, DeLaval International, Tumba, Sweden) is an automated biosensor technology that samples and quantifies milk progesterone (milk P4c) concentrations at frequent intervals starting from about 3 wk after calving until pregnancy. Our objective was to validate the use of pregnancy notifications generated by IMAS based on milk P4c after AI to determine pregnancy and non-pregnancy statuses in dairy cows. Records of 1,821 AI from 715 Holstein cows that had milk P4c (ng/mL) measured every 2.2 ± 1.9 d (mean \pm SD) from 24.5 ± 8.2 to 173.4 ± 49.3 DIM through IMAS were evaluated. Based on variations in milk P4c (< vs. \geq the 5.0 ng/mL threshold), the IMAS determined the sampling frequency, onset and cessation of luteal phases, and pregnancy. If a luteal phase initiated (milk P4c increased to ≥ 5.0 ng/mL) after AI and remained uninterrupted, a pregnancy notification was generated starting at (mean \pm SD) 31.0 ± 4.3 d until 53.4 ± 7.9 d after AI, when sampling stopped, unless milk P4c declined below 5.0 ng/mL indicating non-pregnancy and estrus. The assessment of IMAS pregnancy notification at different intervals was tested. The occurrence of a confirmed calving event between 262 and 296 d after AI (expected gestation length), with no other subsequent AI recorded, was used as the "gold standard" for pregnancy. In all, 14.1 (256/1,821), 41.0 (746/1,821), and 50.7% (924/1,821) of AI events were followed by a decline in milk P4c (indicating non-pregnancy) before 19, 23, and 30 d after AI, respectively. Based on pregnancy notifications alone, 46.8 (853/1,821) and 40.9% (744/1,821) of AI events were declared pregnant at 30 ± 3 d and at 55 ± 3 d after AI, respectively, and 40.8% (742/1,821) confirmed pregnant based on the gold standard. At any time point between 27 and 54 d after AI, the proportion of pregnant cows correctly diagnosed as pregnant (i.e., sensitivity) was 95%, and the proportion of cows diagnosed as non-pregnant that were truly non-pregnant (i.e., negative predictive value) was 96%. The proportion of non-pregnant cows correctly diagnosed as non-pregnant (i.e., specificity) were less than 90% for pregnancy notifications before 40 d but greater than 94% for pregnancy notifications beyond 41 d after AI.

Take Home Message: The Herd Navigator™ system is able to diagnose pregnancy based on progesterone profiles with high precision and determine early non-pregnancy. For accuracy greater than 95%, pregnancy declaration, if based only on the system's pregnancy notification, should not occur earlier than 41 d after AI.