

Fresh Cow Illness Detection Using Milk and Rumination Data in Robotic Milking Systems

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The objective of this study was to investigate potential changes in productivity and behaviour useful for earlier or automated illness detection in early lactation.

We collected daily production and behaviour data for early lactation cows in two studies: (1) one research herd for 13 months (n = 57 cows), and (2) nine commercial herds for 6 months (n = 607 cows). Data on rumination time, milk yield, and many other parameters were recorded electronically. Cases of illness were diagnosed and recorded, including subclinical ketosis (SCK), displaced abomasum (DA), mastitis, and pneumonia. For each disease, analyses were performed to identify the day on which each measure deviated significantly from a healthy baseline. The following results describe reductions in daily milk yield and rumination time, while accounting for DIM, from that day of deviation until the day before diagnosis, when treatment took place and recovery began.

In the first study, daily rumination time declined by 41, 20, and 51 min/d from 8, 6, and 5 d prior to diagnosis of DA (n = 5), SCK (n = 23), and pneumonia (n = 8), respectively. Milk production declined by 4.7 and 4.0 kg/d from 4 d prior to DA and pneumonia diagnoses, respectively, and by 1.1 kg/d from 5 d before SCK detection, when accounting for DIM.

In the larger study of 9 farms, daily rumination time declined by 29 min/d from 6 d before DA (n = 7), by 17 min/d from 5 d to mastitis diagnosis (n = 39), and by 5 min/d for 10 days before SCK detection (n = 199). Milk production dropped by 2.7 kg/d from 5 d before DA and by 1.7 kg/d from 4 d before mastitis. In the case of SCK, milk yield did not decline with illness or increase as it should with DIM, but plateaued before SCK detection and declined afterwards.

Implications: Before the diagnosis of many different types of early lactation health disorders, daily rumination time often declined prior to milk yield. This suggests that rumination behaviour, in addition to milk production, could contribute to more refined alerts for fresh cow illness detection. Accounting for DIM could further improve the sensitivity of alerts to identify more subtle deviations in early lactation.