

Behaviour and productivity of cows milked in automated systems before diagnosis of health disorders in early lactation

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Why is this important?

Automated milking systems (AMS) collect a *lot* of information on your cows. This data is used to create alerts and attention lists that can help identify cows that are at risk of developing, or have developed, a health problem. To date, these alerts are largely focused on mammary infections, such as mastitis, rather than lameness or metabolic disorders.

A decline in rumination time, changes in activity, and body weight data are a few measures that have been associated with the onset of many health disorders, including mastitis, metabolic disorders, subclinical ketosis, and reproductive issues (e.g. retained placenta and metritis). Finding a prediction model that would allow producers to identify cows at risk of health issues, as opposed to only identifying these animals once the disease has already set-in, would be very helpful for herd management moving forward. These researchers set out to do just that!

The objective of this study was to examine associations of electronically recorded variables to identify health disorders in early lactation cows milked by AMS. Rumination, activity, milk yield, and BW data were examined relative to diagnoses of subclinical ketosis, displaced abomasum, severe endometritis, lameness, and mastitis. Researchers hypothesized that deviations in these variables would occur before diagnosis, allowing them to be used in the future to predict whether an animal would develop a health disorder.

What did we do?

Participating farms all milked Holstein cows using a Lely AMS and were using the AMS rumination monitoring system. A total of 605 fresh cows from 9 herds were enrolled, with data collection occurring over 8 months. Over the course of the trial, average stocking density at the AMS was 53 +/- 9 cows per AMS unit. All 9 farms used free cow traffic and most housed cows in freestalls (one farm used bedded pack). Farms were visited once weekly during the entire study period.

From 0 to 50 DIM, health disorders were monitored either daily by producers (displaced abomasum, clinical mastitis) or once weekly by researchers (subclinical ketosis, lameness, and purulent vaginal discharge). Lameness was scored in weeks 1, 3, and 5 of lactation using a 5-point numerical rating system. Milk data was collected automatically by the AMS daily for each cow, including visit outcome (refusal, failure, milking), milk yield, milk temperature, milk conductivity, and amount of concentrate supplement offered. Rumination time and activity data were collected by electronic rumination detection loggers on the neck collar of each cow.



What did we find?

Displaced Abomasum

Throughout the 14 days before DA diagnosis, affected cows produced less milk in fewer milkings per day and spent less time ruminating than healthy cows. Supplement intake began dropping at 11 days before diagnosis and milk temperature was altered at 3 days before diagnosis.

Clinical Mastitis

For the majority of the 14-day period leading up to mastitis diagnoses, affected cows had lower milk production, rumination time, refusal frequency, and milk temperature than healthy cows while having greater maximum milk conductivity values. From 6 days before diagnosis, cows had lower milking frequency and supplement intake.

Development of Lameness

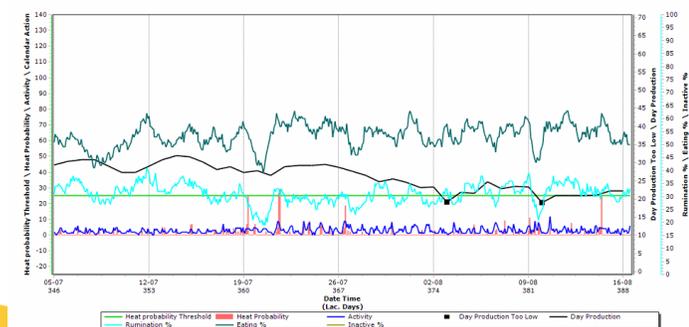
Compared with healthy cows, those that developed a new case of lameness had lower milk production and fewer milkings per day throughout the 14-day period before diagnosis. They also generally consumed less supplement from 8 days before diagnosis onward.

Subclinical Ketosis

During most of the 8-day period before diagnosis, cows consumed less supplement and had fewer milkings per day compared with healthy cows. Cows with subclinical ketosis also spent less time ruminating and had lower milk temperatures.

Severe Endometritis

There were no differences between groups.



What does it mean?

Prior to diagnosis, cows with acute health disorders (DA or mastitis) had significant deviations from normal in terms of productivity and behaviour. Milk yield and rumination time declined sharply for both disorders; cows with DA deviated in activity and milk temperature, whereas cows with mastitis deviated in milking frequency and supplement intake. More chronic disorders, such as subclinical ketosis and lameness, were associated with significant but subtle longer-term changes in productivity and behaviour.

Although many variables could be incorporated into a predictive model, some measures (e.g. rumination time) were considerably more sensitive than others (e.g. milking frequency). Of note, rumination data detected deviations in production or behaviour earlier than milk yield data. As such, health alerts should flag cows with declining rumination behaviour before their declining milk yield in an effort to detect at-risk cows sooner.

Finally, the researchers found that cows with health disorders deviated from a group of healthy cows before they deviated from their own baseline and before deviating from the average of all other cows. Therefore, in addition to examining cows relative to their own baseline trajectory, including a healthy reference group could improve the sensitivity of alerts that may be used to identify subtle deviations in these measures.

Summary Points

- Data collected by the AMS and rumination monitors allowed a displaced abomasum and clinical mastitis to be detected 4 to 12 days before diagnosis.
- More chronic disorders, such as subclinical ketosis or lameness, were associated with significant but subtle and longer-term deviations in productivity or behaviour.
- These measures, and inclusion of a reference group of healthy cows, could be incorporated into new predictive health alert models to enable earlier detection of cows at risk of developing health issues.