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“The use of rumination monitoring can improve early diagnosis of health disorders.”

Technology Detection of Health Disorders

A shortage of labor available for working in agriculture coupled with a rapid advance in robotic and automation technology has increased the implementation of robotic milking on dairy farms. A study published in the *Journal of Dairy Science* evaluated milk performance on automatic milking systems in North American dairy farms. The researchers (Tremblay et al., 2016) identified risk factors associated with daily milk production at 635 dairy farms with robotic milking. This included 54,065 observations. In summary, these factors were the most important:

- 1. Traffic type:** Free traffic daily produced 2.4 lb. more per cow (148 lb. per robot) than forced traffic.
- 2. Robots per pen:** Two robots per pen (120 cows) had greater daily milk production per robot compared with one robot per pen (60 cows).
- 3. Feed offering:** A higher offering of concentrates in the robot was associated with lower milk production.

One of the advantages of robotic milking systems is the capacity for gathering and analyzing data. Most modern milking robots register milking efficiency, concentrate intake, cow body weight, rumination time and activity. A Canadian study examined potential changes in productivity and behavior associated with, and preceding, naturally occurring health disorders in a herd of cows milked with an automated system. The authors (King et al., 2017) monitored 57 Holstein dairy cows (19 first lactation) throughout lactation at the University of Guelph, Kemptville Campus Dairy Education and Innovation Center, Ontario, Canada.

Cows diagnosed with displaced abomasum, pneumonia, hoof disorders and subclinical ketosis exhibited declining milk yields before diagnosis:

- From one to four days before diagnosis with displaced abomasum and pneumonia, milk yield decreased by 9.7 lb. per day and 9 lb. per day respectively.
- Milk yield fell by 2.6 lb. per day from one to five days before subclinical ketosis.
- From one to 14 days before diagnosis with hoof disorders, cows produced 0.68 lb. per day less milk.

Surprisingly, milking frequency was not affected by most of the health disorders. This declined only before diagnosis of hoof disorders in the 14 days leading up to diagnosis (0.05 milkings per day). In addition, the authors estimated potential changes in daily rumination time (DRT) associated with health disorders. Cows diagnosed with diseases exhibited declining DRT before diagnosis:

- From one to eight days before diagnosis with displaced abomasum, DRT decreased by 44.8 minutes per day.
- From one to five days before pneumonia diagnosis, DRT dropped 49.7 minutes per day.
- DRT decreased by 25.5 minutes per day from one to six days before subclinical ketosis.
- From one to 14 days before diagnosis with hoof disorders, cows dropped DRT by 2.9 minutes per day.

The results of this study show the use of rumination monitoring to improve early diagnosis of health disorders in lactating cows. **M**