

## Understanding the Lying Behaviour Patterns of Cows Milked In Automated Systems

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There is mounting evidence that monitoring behaviour over time may have considerable utility for prediction and identification of health and welfare concerns in dairy cattle (von Keyserlingk et al., 2009). Recent publications have reported on changes in behaviour associated with various health issues, including lameness and periparturient disease (Weary et al., 2009). Recent research has demonstrated that lying behaviour patterns may be associated with feeding management and udder health in lactating dairy cows housed in tie stalls (DeVries et al., in review). It can be hypothesized that the lying behaviour patterns of cow milked in an automated milking system (AMS) would be different from those milked in a conventional system, particularly since the distribution of milking events in an AMS occurs over a 24 h period. Winter and Hillerton (1995) noted less synchrony in the behaviour of AMS milked cows, resulting in less daily time spent lying down. Alternatively, Hermans et al. (2003) found that AMS milked cows had similar daily lying times to conventionally milked cows. To date, little is known about how dairy cows distribute their daily lying time when milked in AMS, and the factors that influence these lying behaviour patterns. The objective, therefore, of this research was to describe the lying behaviour patterns of dairy cows milked in an AMS and determine how cow-level factors influence these patterns.

### Materials and Methods

A study was conducted in which 111 lactating Holstein dairy cows ( $136.9 \pm 87.9$  DIM; 37 primiparous and 74 multiparous) were followed from June to August 2009. All cows were kept on a commercial dairy farm (Williamsburg, ON, Canada) in a free stall barn with 2 symmetrical pens, each containing 60 lying stalls, 0.7 m/cow (2.3 feet/cow) of feeding space, 3 water troughs, and an AMS (Astronaut A2, Lely Industries NV, Maassluis, The Netherlands). Pens were arranged for free cow traffic to the AMS. Lying behaviour of the cows was collected automatically using data loggers (HOBO Pendant G Data Logger, Onset, Pocasset, MA). This device measured leg orientation at 1 min intervals and allowed for the calculation of daily lying time, lying bout frequency and lying bout length. Once per week, data loggers were attached to approximately one-quarter of the entire herd (split between each pen), and kept on each cow for 7 days. As result, lying behaviour data was captured for each cow for one week each month for a total of 21 days of lying behaviour data for each animal. All milking event were automatically collected by the AMS. Relationship between measures of cow lying behaviour and milking parameters were assessed using the regression procedure of SAS 9.1.3 (SAS Institute Inc., Cary, NC). A stepwise regression was used to identify whether milking frequency and milk yield made significant contributions to predicting measures of lying behaviour. The level of significance for a variable to enter and to stay in the model was  $P \leq 0.15$ . Only those models that were significant are reported.

## Results

Overall, on average, cows spent  $11.2 \pm 2.0$  (mean  $\pm$  SD) h/d lying down. This lying time was dividing into  $8.0 \pm 2.2$  bouts/d, which were on average  $95.2 \pm 30.8$  min in length. Cows were milked  $2.3 \pm 0.7$  time per day and produced  $32.8 \pm 10.6$  kg/d ( $72.3 \pm 23.4$  lbs/d). The linear regression models describing the relationship between milking parameters and measures of lying behaviour are presented in Figures 1a and 1b. Both daily lying time ( $y = -0.07x + 13.3$ ;  $R^2=0.10$ ) and lying bout length ( $y = -0.9x + 127.3$ ;  $R^2=0.11$ ) were negatively correlated ( $P<0.001$ ) with daily milk yield.

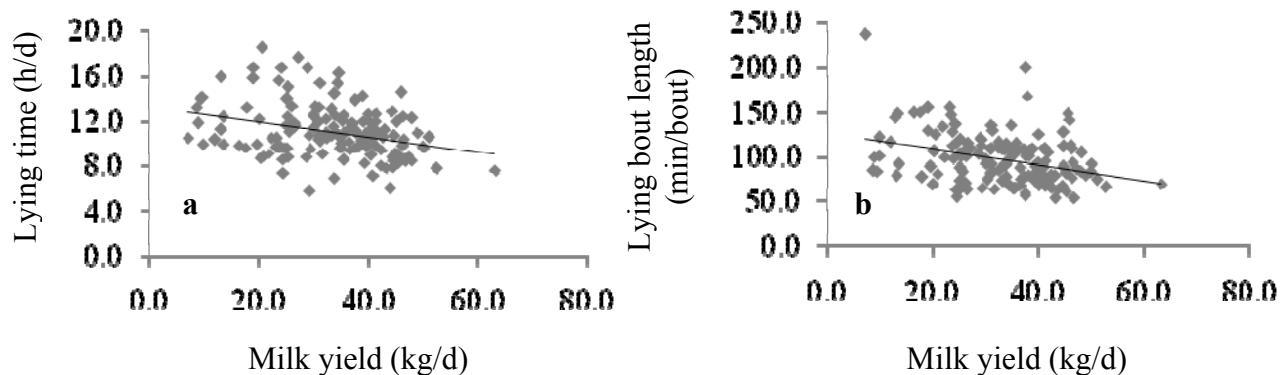


Figure 1. Relationship between milk yield and a) daily lying time and b) lying bout length for cows milked in an AMS.

These data indicate that those cows with higher milk yield had lower daily lying time, distributed in shorter bouts of time. This would seem to contradict the belief that longer lying times are beneficial for milk production. Given that milk production was positively related to milking frequency ( $y = 11.3x + 7.8$ ;  $R^2=0.4$ ;  $P<0.001$ ), this result is not surprising. It follows that higher milking frequency would result in cows getting up for milking more often, and thus have shorter lying bouts and spend more time standing overall. Further work needs to be completed to determine how these behavioural patterns relate to the health status of these cows.

## References

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