REMOTE COLLECTION OF BEHAVIOURAL AND PHYSIOLOGICAL DATA TO DETECT LAME COWS

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ABSTRACT

The hypothesis tested was that sensor data from milk meters, pedometers and weigh scales would help farmers in detecting lame cows earlier. Sensor data from ~5,500 cows were transferred automatically to a central database each evening, starting in November 2010. To date, 362 cases of lameness have been recorded with sensor data available for analyses. Each case was randomly matched to a non-lame cow. Compared with non-lame cows, lame cows have lower activity and weight, and present themselves later for milking several days before clinical detection. Activity and milking order showed significant differences between lame and non-lame cows on the day the lame cow was detected.

Keywords: lameness, dairy cows, sensor data, early detection

INTRODUCTION

Lameness is consistently placed together with mastitis and infertility in the top three of cow health issues by farmers (Gibbs and Laporte, 2007). Methods for detecting lameness are required for early diagnosis, treatment and faster cure to minimise effects on animal welfare and productivity. In practice, farmers identify lame cows by observing their gait, but this becomes increasingly difficult with larger herds and less skilled staff. The hypothesis was that physiological (e.g., milk yield) and behavioural (e.g., activity) sensor data, collected at each cow milking, can help farmers detect lame cows earlier.

MATERIALS AND METHODS

Six farms milking large herds (mean 770, range 432-1628) through rotary dairies in Waikato, New Zealand, were enrolled starting in November 2010. Herd management software recorded data from milk meters (yield, milk duration, milking order), pedometers (activity) and weigh scales (live-weight) for each cow at each milking and these data were transferred automatically to a central database each evening. Farmers were trained (Healthy Hoof Programme) and supported by monthly visits from a technician in detecting and diagnosing lameness.

By the end of February 2012, 408 cases of lameness were recorded; 362 with sensor data. For each case, sensor data were retrieved for 14 days prior to and including the day of observation. Each case of lameness was randomly matched within farm to a non-lame cow, for which the same time period, if available, was selected. A nonparametric sign test was conducted to assess if differences in sensor data between lame cows and their paired controls were statistically significant at the 5% level.

RESULTS AND DISCUSSION

In total, 339 pairs were available with sensor data the day the lame cow was observed. Compared with non-lame cows, data indicate lame cows decrease activity and weight, and change their milking order (milk later) over several days prior to detection by trained farmers. Changes in behaviour data seems most promising for early detection of lame cows as they are milked later ($P<0.05$) and are less active ($P<0.05$) on the day of observation, but not at 7 to 14 days prior to observation (Table 1). No significant differences in milk yield or milk duration were found between lame and non-lame cows. This research model used commercial farms, allowing a large number of cases collected in a relatively short time, providing relevance to the output and field testing of technologies.

REFERENCES

Gibbs, J., J. Laporte. 2007. The South Island Dairy Lameness Group Project. p. 268-273. In *SIDE Proceedings*, N. Gow (ed.), 18-20 June 2007, Lincoln University, Lincoln. The Caxton Press, Christchurch, New Zealand.

Table 1. Mean values for lame and non-lame cows at 14 days and 7 days (D -14: 304 pairs; D-7: 316 pairs) prior to and on the day of observation (D 0: 339 pairs)

Sensor data	Time point	Lame	Non-lame
Milking order	D -14	322 [a]	303 [a]
	D -7	326 [a]	311 [a]
	D 0	479 [a]	318 [b]
Milk yield (kg)	D -14	10.3 [a]	10.2 [a]
	D -7	10.1 [a]	10.1 [a]
	D 0	9.7 [a]	9.8 [a]
Milking duration (min)	D -14	6.1 [a]	6.0 [a]
	D -7	6.1 [a]	6 [a]
	D 0	6.1 [a]	5.8 [a]
Weight (kg)	D -14	487 [a]	474 [b]
	D -7	483 [a]	471 [a]
	D 0	473 [a]	475 [a]
Activity (steps taken)	D -14	354 [a]	361 [a]
	D -7	353 [a]	361 [a]
	D 0	267 [a]	372 [b]

[a,b] Different superscripts indicate significant differences between lame and non-lame cows at 5% level