

Individual lying patterns of high producing dairy cows during transition time characterised by behaviour sensors

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Recently commercial behaviour sensors allow continuous monitoring of behaviour variables in order to detect health and welfare problems (Livshin et al., 2005). The objectives of the present study were to analyse behaviour variables (lying time, maximal steps per hour) of healthy cows during transition time in relation to age of the cow, environmental conditions and production performance. The study involved 210 individual healthy multiparous Israeli Holstein cows in three commercial dairy farms of varying size (60 – 250 milking cows). Only healthy cows during the first 28 days after calving were selected for this study. Data included in this study were collected from 2007 until 2010. Data were analysed for calving season, age of cows and then divided into two subgroups: one with positive correlation between milk production and lying time and one with negative correlation.

Table 1. Milk production, maximal number of steps per hour, lying time and body weight per lactation number and calving season.

Lactation number	2		3 and more	
	Mean	STD	Mean	STD
	Summer			
Milk production (kg/day)	40.4	6.7	43.2	6.7
Maximal number of steps per hour (steps/hour)	175	20	172 ^B	21
Lying time (min/day)	491^{cC}	17	520^{cC}	25
Body weight (kg)	624 ^{cB}	16	687 ^c	19
	Winter			
Milk production (kg/day)	41.1	7.7	43.5	8.3
Maximal number of steps per hour (steps/hour)	165	24	155 ^B	23
Lying time (min/day)	531^{cC}	25	579^{cC}	38
Body weight (kg)	644 ^{cB}	17	693 ^c	19

a, b, c: significant difference between columns ($P < .05, .005, .0001$, respectively)

A, B, C: significant difference between rows ($P < .05, .005, .0001$, respectively)

Lying time increased significantly with age and is significantly higher in winter than in summer (Table 1). During the first days after calving, the cow spent less time lying down than later in lactation, which correlated negatively with the maximal number of steps per hour. Alterations in behaviour may be attributed to heat stress in summer, while behavior during winter is affected mainly by the production process and interactions between animals.

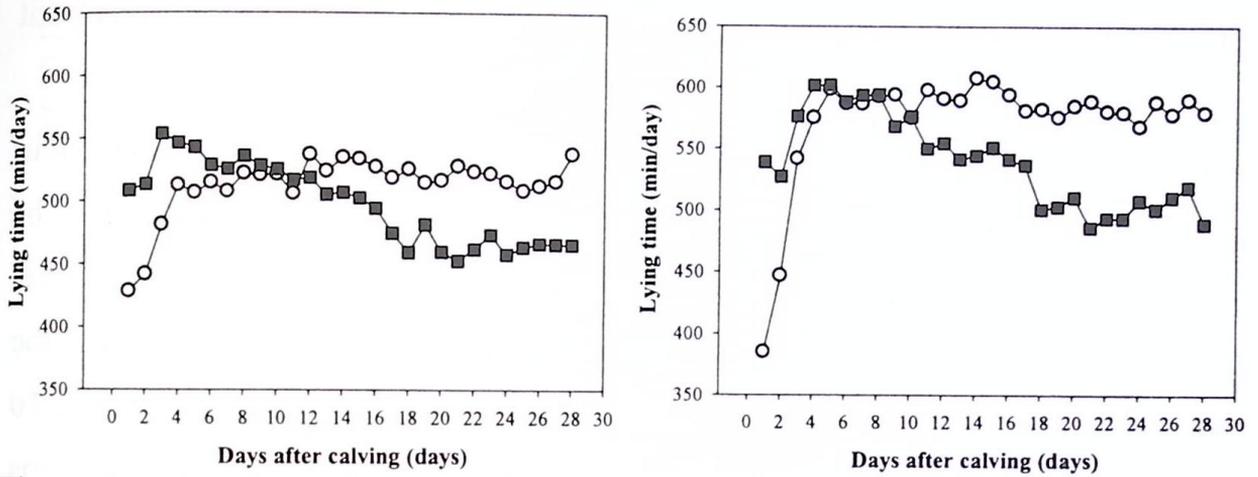


Figure 1. Lying time of summer (left panel) and winter calving cows (right panel) with positive (○) and negative (■) correlation between milk production and lying time.

The proportion of positively and negatively milk production and lying time correlated cows was both 50 % when all cows were considered. However, this is affected by calving season. Cows that calved in summer have more often (56 %) a negative correlation than cows that calved in winter (43 %). Analyzing the lying patterns of positively milk production and lying time correlated cows and negatively correlated cows revealed a significant difference (Figure 1). After 8 to 10 days after calving, the lying time for the positively milk production and lying time correlated cows remained more or less constant whereas the lying time of negatively correlated cows declined despite the fact that milk production is still increasing. This study indicates that behaviour variables during transition time are affected by calving season and lactation number. Positive and negative correlations between milk production and lying time are strongly affected by calving season, in opposite proportions between summer and winter. In the future, these results may be used as a 'base-line' for detection of alterations in behaviour that indicate health problems.