



CASE STUDY: Characterization of lying behavior in dairy cows transitioning from a freestall barn with pasture access to a compost bedded pack barn without pasture access

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ABSTRACT

Lying times of 10 lactating Holstein cows were monitored using an activity monitor to assess lying times. Changes were recorded while transitioning from a freestall barn with pasture access to a newly constructed compost bedded pack barn in a private dairy herd. An IceTag (IceRobotics Ltd., Roslin, Scotland, UK) animal activity-monitoring sensor measuring posture (lying vs. standing) and steps was attached to a hind leg of each cow above the fetlock. The MIXED procedure of SAS version 9.3 (SAS Institute Inc., Cary, NC) was used to fit a model describing the differences in lying time between the 2 housing systems. More cow days were recorded ($n = 495$) for the freestall barn than the compost bedded pack barn ($n = 132$). Overall, lying times were longer for sound cows (locomotion category ≤ 2 , 11.6 ± 0.5 h/d) than lame cows (locomotion category ≥ 3 , 10.5 ± 0.5 h/d) ($P < 0.01$). In the freestall and

pasture system, sound cows lay down more than lame cows (10.1 ± 0.5 and 8.0 ± 0.5 h/d, respectively, $P < 0.05$); however, after transition to the compost bedded pack barn, there was no difference in lying time between lame and sound cows (13.1 ± 0.5 h/d, respectively, $P < 0.05$). Overall, hours of lying per day were longer ($P < 0.01$) after the cows transitioned into the compost barn from the freestall barn with pasture access (least squares means 13.1 ± 0.5 and 9.6 ± 0.5 h/d, respectively).

Key words: compost bedded pack barn, freestall barn, lying time

INTRODUCTION

Lying time in dairy cattle has been linked to lameness incidence, behavior, rumination, and changes in feeding time (Cooper et al., 2007; Dippel et al., 2009; Ito et al., 2010; Lobeck et al., 2011). Compost bedded pack barns (CBP) have the potential to increase lying time and alleviate the negative factors associated with

lying-time deprivation. A CBP barn consists of a large, open resting area generally bedded with sawdust, dry fine wood shavings, or other organic material (Shane et al., 2010). Barns are designed so that all cows can lie down at the same time with room for them to get up for feed or water without disturbing another cow (Janni et al., 2006). Another loose housing system, the strawyard system, contains a large, open area similar to a compost barn and has been compared with cubicle-based housing. High-producing cows with a low space allowance spent 52% of time lying in strawyard, in comparison with 39% of time lying in cubicle housing, indicating a greater degree of comfort and welfare in the strawyard system (Fregonesi and Leaver, 2002).

The IceTag (IceRobotics Ltd., Roslin, Scotland, UK) animal activity-monitoring system uses accelerometer technology to monitor lying, standing, and stepping behavior and has been validated by comparison with direct visual observations (Munksgaard et

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Table 1. Daily mean, SD, maximum, and minimum for 627 analysis days of 10 experimental cows transitioning from a freestall and pasture system to a compost bedded pack barn

Variable	Freestall and pasture (n = 495)			Compost (n = 132)		
	Mean	SD	Range	Mean	SD	Range
Parity	1.6	1.0	1.0 to 4.0	1.7	1.0	1.0 to 4.0
Daily milk yield (kg/d)	31.5	4.9	17.5 to 38.1	30.6	5.5	17.6 to 37.7
DIM	172.2	77.1	71.0 to 320.0	220.6	73.4	143.0 to 340.0
Locomotion score ¹	1.9	0.8	1.0 to 3.0	1.9	0.8	1.0 to 3.0
Hygiene score ²	1.4	0.5	1.0 to 2.0	1.4	0.5	1.0 to 2.0
Lying (h/d)	9.4	3.0	0.8 to 16.3	13.1	1.8	8.8 to 17.7
Lying bouts (no./d)	17.3	23.9	1.0 to 184.0	26.7	27.8	5.0 to 107.0
Mean duration of lying bout (min)	69.2	43.6	2.7 to 400.6	59.7	34.5	7.9 to 152.6
Steps (no./d)	1,989.4	1,166.2	556.0 to 6,183.0	1,484.7	765.4	277.0 to 3,816.0

¹Locomotion score (1 to 5) was measured according to Sprecher et al. (1997).

²Hygiene score (1 to 4) was measured according to Ruegg and Schreiner (2002).

al., 2006; McGowan et al., 2007). This technology provided a way for researchers to examine lying behavior in a less time-consuming fashion than video or direct observation. The objective of this study was to use the IceTag to determine how lying time changes as cows transition from a freestall barn with pasture access to a newly constructed compost bedded pack barn.

MATERIALS AND METHODS

Data were collected from a private Kentucky dairy farm from December 2008 to February 2009. The herd consisted of 123 milking cows with a rolling herd average milk yield of 8,788 kg in December 2008. Two treatment periods were assigned for the farm, CBP and freestall with pasture (**FP**). The FP treatment provided cows with

access to a freestall facility consisting of wood plank freestalls without neck rails and a clay base with sawdust bedding and pasture, whereas the CBP treatment kept cows in a newly constructed compost bedded pack barn (9.3 m² per cow) with no access to pasture. The dairy producer constructed the barn for improved cow comfort and cleanliness with a desire to keep cows housed indoors at all times. During the FP treatment period, cows had access to pasture at all times, with time spent on pasture varying throughout the study period based on changing weather conditions. Twenty-four Holstein-Friesian cows were selected randomly for the study, with cows at varying stages of lactation and milk yield. Milk-yield data were collected from the Dairy Herd Improvement Association. Mean milk yields from the December 19, 2008, and January 22, 2009, test dates were used as the milk-production level for the FP treatment. Mean milk yield from the February 19, 2009, test date was used as the milk-production level for the CBP treatment.

Any cow that was visibly limping at the beginning of the study was excluded from the study to avoid bias toward either system. All cows were scored for locomotion using a 1 to 5 scale before tag attachment (Sprecher et al., 1997). An IceTag animal activity-monitoring sensor was attached

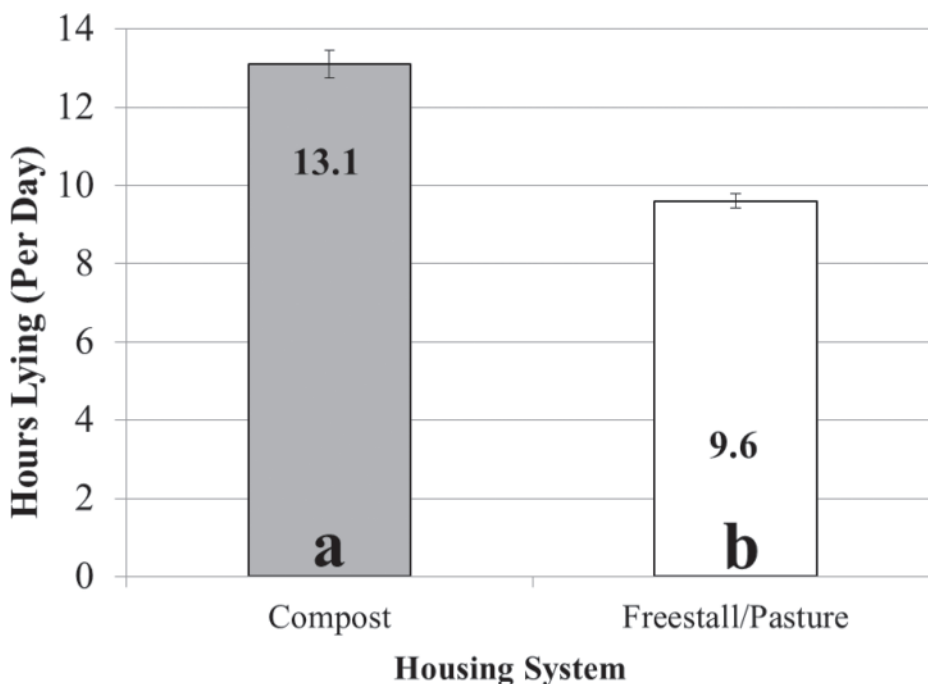


Figure 1. Least squares means for average daily hours lying per housing system for 10 cows transitioning from a freestall and pasture system to a compost bedded pack barn. Least squares means with different letters (a, b) differ ($P < 0.05$).

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