

# **A COMPARISON OF DAIRY COW BEHAVIOR IN SAND AND MATTRESS FREE STALL BARNs IN RELATION TO LAMENESS**

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## Introduction

Cook (2003) found a significantly lower prevalence of lameness in a group of Wisconsin dairy herds using sand stalls compared to those using other types of stall surface, which included rubber mats and rubber crumb filled mattresses, in both free stalls and tie stalls. Although sand has been suggested as an ideal stall surface for dairy cows (Bickert, 2000), there exists little data to support improvements in cattle health related to its use.

The objective of this study was to identify behavioral differences between cows housed in free stalls bedded with deep sand (SAND) and cows housed in free stalls with rubber crumb mattresses (MAT), which may explain differences in lameness prevalence observed between the two types of barn.

## Materials and Methods

Twelve Wisconsin dairy herds were selected to include six sand stall herds (SAND) and six mattress stall herds (MAT). At a single milking, all lactating cows, including those in the sick pen, were locomotion scored and the prevalence of clinical lameness was calculated for each herd. For the duration of one 24 hour period, during which no other farm management practices were performed, the mature cow high group pen on each farm was video filmed. Ten cows per farm were randomly selected after the morning milking and color marked with spray paint with a distinctive pattern so that cows could be individually tracked. Each cow was locomotion scored. Location in the pen (alley or stall), activity (standing, lying, feeding, drinking) and time spent performing each activity (to the nearest minute) was recorded for each marked cow.

The data were analyzed using the mixed procedure of SAS. One way ANOVA was used to compare cow and herd level data and a mixed effect model was created to investigate differences in cow behavior between SAND cows and MAT cows.

## Results

Mean (SE) lameness prevalence was significantly higher in MAT herds (24.0%, 2.1) than in SAND herds (11.1%, 1.3), ( $P < 0.001$ ).

There were no significant differences in parity, days in milk at the day of visit, last DHIA recorded daily milk yield and last DHIA recorded ME305 milk yield between cows selected for filming in SAND herds and those selected in MAT herds. Normal sound cows behaved similarly in both types of barn with respect to time spent milking, eating, socializing and lying down. Although lying time was similar, the manner in which it was obtained showed interesting differences. Cows in SAND herds had a significantly greater proportion (SE) of lying bouts which were greater than 60 min (0.61, 0.03) than cows in MAT herds (0.49, 0.03), (P=0.03).

Time spent standing in the stall with all four feet on the platform or perching with two feet on the stall platform and the rear feet in the alley was significantly different between the two groups. Normal cows in MAT herds stood in stalls for 2.4h/d compared to cows in SAND herds that stood for 1.7h/d. Time up in stall for slightly lame cows in MAT herds was 4.4h/d compared to 2.1h/d in SAND herds (P<0.0001) and for moderately lame cows in MAT herds it was 6.1h/d compared to 1.8h/d in SAND herds (P=0.0183). Moderately lame cows in MAT herds took 46% fewer lying sessions per day and lay down for only 10.0h/d.

Table 1. Effect of Locomotion Score and Stall Base Type (SAND v MAT) on Daily Activity Time Budgets

Mean (SD) Activity h/d	Locomotion Score					
	1 (normal)		2 (slight lame)		3 (moderate lame)	
Stall base type	Mat	Sand	Mat	Sand	Mat	Sand
Lying time	12.0 (2.1)	12.0 (1.6)	11.7 (2.3)	12.0 (2.8)	10.0 (4.9)	12.8 (0.2)
Standing in Stall (including perching)	2.4 (1.4)	1.7 (0.8)	4.4 (2.2)	2.1 (1.9)	6.1 (3.9)	1.8 (1.6)
Time standing in alley (including drinking)	2.8 (1.7)	2.3 (1.2)	1.6 (0.5)	2.2 (1.4)	1.4 (0.7)	1.8 (0.1)
Time Up Feeding	4.3 (1.0)	4.7 (1.0)	3.8 (1.1)	4.6 (1.3)	3.5 (1.1)	5.1 (0.4)
Time Up Milking	2.5 (0.7)	3.3 (1.2)	2.6 (0.6)	3.2 (0.8)	3.0 (0.9)	2.7 (1.3)

## Discussion

Mean daily lying time for cows housed in sand free stalls was higher than previously reported (Manninen et al., 2002; Tucker et al., 2003) at 12h/d. The surface cushion provided by sand appears to result in a greater proportion of long duration (> 60 min) lying bouts compared to a mattress surface.

Few studies have accurately documented the behavior of lame cows in free stall barns. Singh et al. (1993) compared behavioral differences in free stall housing. Lame cows lay down for longer (8.3 h/d) than normal cows (6.8 h/d) and spent more time standing in the stalls, the differences however were not statistically significant. Margerison et al. (2002) documented behavior of cows

by locomotion score. They noted that stall occupancy (both standing and lying) increased with increasing locomotion score, but failed to examine stall standing and lying behavior separately.

Altered daily activity time budgets were identified in lame cows in this study in cows on mattress free stalls. Increased time spent standing in the stall compressed the time available for other activities such as socializing in the alley, feeding and ultimately lying down - due to a reduction in the number of lying sessions per day. This alteration in activity was not observed in lame cows on sand free stalls.

We speculate that the surface traction provided by sand allows lame cows to rise and lie down more easily, without fear of slipping, thereby maintaining normal lying session behavior in cows with sore feet. The pain and fear associated with rising and lying in lame cows on a mattress stall surface leads to extended bouts of standing in the stall during a lying session. Extended time spent standing in the stall may be detrimental to claw health, increasing the duration of lameness and explaining the higher prevalence of lameness observed in MAT herds.

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