

Time Budgets of Lactating Dairy Cows: Who are the Big Players?

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Introduction

The freestall barn has emerged as the dominant housing system in North America and, with it, dairy cows face new challenges, trying to adapt their behavior in response to the new environment and management practices. The freestall design has been shown to impact cow performance, and essential activities such as feeding or resting are dependent on it. Deep understanding of how dairy cows distribute their activities during the day can be translated in enhanced facility designs and improved management practices. This study aimed to examine the relationships between the cow's time budget components and the effect of lameness, housing conditions and demographic characteristics such as days-in-milk or lactation number.

Materials and Methods

A cross-sectional study of the daily time budget using 24 hours of continuous video surveillance was performed in 16 freestall barns in Wisconsin. Time lying down in the stall (TL), time standing in the stall (at least one foot touching the stall-TS), time standing in the alleys or drinking (TAD), time feeding (cow's head over the feed bunk-TF) and time milking (time out of the pen for milking and transit-TM) was measured for 205 cows, with each herd contributing between 12 and 34 cows. The number of lying bouts and the average duration of a lying bout was also determined. In order to avoid heat stress effects on behavior, all data was collected below a mean ambient temperature of 65°F (18.3°C). A locomotion score system of four points was used to evaluate lameness. Linear mixed models were used to evaluate each of the time budget elements.

Results

Time milking is determined by parlor efficiency, milking frequency, pen size, stocking density, and transfer time between the pen and the parlor. Dairy cows cannot voluntarily allocate time on that activity being dependent on farm characteristics and management

decisions. The TM model reflects that characteristic showing stocking density as the only factor that influences TM, and surprisingly, milking frequency (two or three times per day) not affecting it. TM was included as a fixed effect in the rest of the time budget elements evaluation, attempting to correct for the differences between farms in time available for the cows in the pen. Lameness, type of stall base (sand or mattress) and TM appear to be the factors most strongly associated with the voluntary cow activities (TL, TF, TAD, and TS). Particularly, TF was significantly associated with TL, TM, locomotion score, lactation number, type of stall base, milk yield, and number of rows in the pen. TAD was associated with TM, TL, locomotion score, and type of stall base. TS was surprisingly not associated with TM, suggesting that the stall design plays a major role in that activity (strongly linked to the type of stall base and, as published in previous studies with locomotion score). And TL was related with TM, days-in-milk, type of stall base, and locomotion score. A prediction of the TL for the different levels of lameness and type of stall base is provided in order to show that cows milked for more than three hours in mattress freestall herds will not lie down for more than 12 hours (being even less when the level of lameness increases). To the contrary, in sand-based freestall herds, cows are predicted to lie down more time for the same hours milking, with the opposite behavior of the very lame cows spending more time resting.

Significance

When TM is expanded, possibly due to poor facility design, parlor inefficiency or over-stocking changes, time spent performing other activities in the pen, including TL, TF and TAD, are negatively impacted. TS is independent of TM and is largely influenced by an interaction between lameness and stall-base type. Lameness, type of stall base, and time available for rest are essential to understand the significance of lying times. Based on those findings, facility designs and behavioral studies should take into account those factors in order to have useful and valid results.