



15th international symposium & conference on
Lameness in Ruminants
9 - 13 June, 2008
Kuopio, Finland

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DAIRY CATTLE BEHAVIOR AND LAMENESS

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Introduction

Any review of the literature of bovine lameness will suggest that etiology of claw horn lesions associated with laminitis has multiple factors. However, as we reflect on the work of herd-level lameness investigators including our own, there is a tendency to focus on single factors such as ruminal acidosis, track management, or others in an extensive list. In the past few years, we have begun to think of herd-level claw horn problems in terms of “get lame, stay lame”. In that phrase, we imply that there are risk factors that initiate a mild claw horn problem, and that other risk factors determine whether the cow recovers or goes on to become lame and chronic. Increasingly, we are identifying two aspects of cow behavior as determinants of the ‘stay lame’ component. First, even the mildest signs of lameness change the behavior of the cow on firm surfaces such as mattress stalls³. Second, rank within the herd has significant effects on individual cows as they interact within the environments of modern dairies. Both of these behaviors can result in extended bouts of standing time beyond which the cow might find comfortable. These behaviors appear to explain many of the confounding situations encountered in herd lameness investigations over the past decades.

Changed standing behavior of lame cows on firm surfaces

Based upon the study by Cook et al.², dairy herds housed in barns with mattress freestalls have approximately double the prevalence of lame cows as herds in sand-stall barns. We hypothesized that

the difference in lameness prevalence was because cows in sand stalls lie down more than cows on mattresses. We were wrong.

In a study that compared cow behavior on sand and mattress freestalls, Cook et al. found that normal cows behave identically on either surface³. In addition, lame cows on deep sand behave identically to normal cows on either surface. However, lame cows on mattresses change their behavior and stand more in the stalls and lie down less (Figure 1). The increased time that lame cows spend standing in the stalls was comprised of extended duration of standing bouts, not an increased number of short standing bouts.

From observing video of cows lying down and rising, we speculate that the extended standing bout length is the result of pain as the hoof interacts with the mattress surface during rising or lying. In the initial rising phase, the “toes” of one hoof bear the entire weight of the rear portion of the cow on a mattress surface, whereas on sand the weight is distributed across the entire hoof surface. We further speculate the profound difference in lameness prevalence between sand and mattress barns is related to the finding that after the onset of mild hoof problems (locomotion score 2), cows on the firmer surface start to stand for longer periods of time, exacerbating the severity and extending the duration of the initial problem³.

Impact of rank within the herd or group

As we investigate herd problems, there are situations where low rank within a herd, in terms of dominance or subordination, appears to be an important risk factor for diseases such as laminitis and ketosis. Lamb has described three different ranking orders in cow herds, dominance, leadership, and parlor entrance

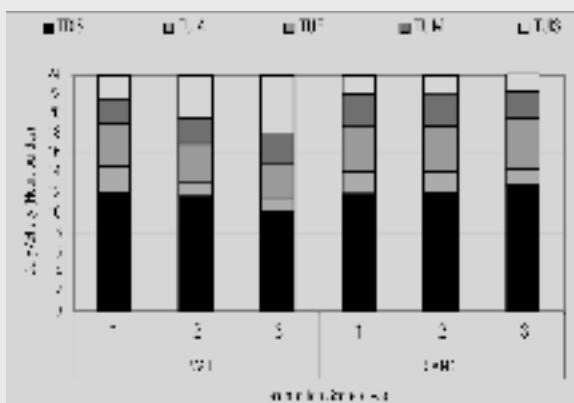


Figure 1. Daily time budgets for time lying in stall (TDIS), time up in stall (TUIS), time up in alley (TUIA), time up feeding (TUF) and time up milking (TUM) in 73 normal (locomotion score 1), 37 slightly lame (locomotion score 2) and 10 moderately lame (locomotion score 3) cows in six MATTRESS and six SAND herds.

order⁶. Dickson reported that cows form dominance hierarchies strongly associated with age, body size, and seniority in herd⁴. Primiparous cows are usually subordinate to multiparous cows⁷. In a number of confinement situations, low rank has the potential to be a significant risk factor for claw horn lesions.

Common Laminitis Problems With a Behavioral Component

Ruminal Acidosis in Herds with Different Housing Conditions

Based upon work with rumenocentesis in predominantly confinement dairy herds in the 1990's, I had developed an impression of a very strong association between subacute ruminal acidosis (SARA) and laminitis. In 1994, An investigation in 1994 of a seasonal-calving grazing herd in Southern Wisconsin showed a high prevalence of SARA, but locomotion scoring of the herd showed less than 5% lameness, which confounded our prior experiences. This herd traveled short distances on excellent tracks to relatively soft sod pastures. Our clinical perspective is that SARA can trigger the initial phase of laminitis, but usually requires extended standing time on firm surfaces to amplify the initial insult into a herd lameness problem.

Acclimation from pasture or bedded packs to confinement housing

Bergsten and Frank identified abrupt changes when cattle are moved from relatively soft surfaces such as pasture or bedded packs onto hard surfaces as a risk factor for laminitis¹. Straw bedded areas have successfully been used to reduce the severity of claw changes triggered at first parturition⁹. I suggest that the straw pack effect is similar to deep sand, allowing slightly lame cows to maintain normal standing and lying behaviors through the peripartum period, in contrast with mattresses or other firm surfaces.

Parlor entrance order and standing time on concrete

The two risk factors discussed above are frequently compounded for first lactation cows by extended standing times in holding areas because of parlor entrance order within herds or pens^{6,8}. First lactation cows in mixed groups are generally low rank and typically among the last to enter the parlor, resulting in repeated bouts of extended standing on concrete. This is a common problem in both extensive grazing and intensive confinement herds. The generally accepted guidelines are that groups should be sized so that no cow spends more than 3 hours per day in the holding area and parlor.

Overstocked confinement barns

Low rank is a risk factor for lameness⁵. With a stocking density of 1 cow per stall, low rank cows spent less time lying and more time standing in freestalls than middle and high-rank cows. By 25 weeks into their lactations, more than 60% of the low rank cows had become lame compared to 18% of the high rank cows.

The impact of low rank appears to be amplified in overstocked conditions, defined here whenever the number of cows in the pen exceeds the number of free stalls. Wierenga and Hopster showed changes in stall access by low rank cows at 125% stocking rates¹⁰. As stall access was reduced, low rank cows shifted lying behavior from night time into early evening hours when competition for stalls was less. At 155% stocking rates, this compensatory mechanism was overwhelmed as stall access in the evening also became reduced and total daily lying time could not be maintained.

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