

# AABP FACT SHEET



## THE INFLUENCE OF COW COMFORT ON HERD LAMENESS PROBLEMS

Authored by the AABP Lameness Committee

### INTRODUCTION

Herd lameness problems have long been associated with poor cow comfort in intensively managed systems for dairy and beef production.

For the development of claw horn lesions, such as sole ulcers and white line disease, increased mobility of the third phalanx within the claw horn capsule appears to be part of the pathogenesis. Time spent standing and loading the claws with the weight of the animal, and the surface that the sole is exposed to during this time, appear to be the two most significant environmental factors exacerbating the severity of the subsequent lesion that forms, and the degree of lameness that is associated with the problem.

For the development of infectious lesions of the hoof, such as digital dermatitis, surface hygiene of the standing and walking surfaces that the cows are exposed to appear to influence the extent of the problem.

This document outlines the areas of cow comfort that require investigation in order to understand the role of the environment in herd lameness problems.

### FACTORS INFLUENCING DAILY STANDING TIME

The mature lactating dairy cow appears to require a minimum of 12 hours of rest per day on a comfortable surface<sup>1</sup>. Lying times less than around 10 hours per day have been associated with lameness problems<sup>2</sup>. Increased time spent standing results from the following issues:

#### Poor stall comfort

From the cow's perspective, a lying surface becomes less desirable if it lacks cushion, if the resting area is too confined and does not provide sufficient space for the imprint of the cow, and where there are obstructions to the lunge and bob move-

ment of the cow's head, and the forward thrust of the forelimb as the cow rises. Under these circumstances normal non-lame animals may rest for only 10 hours per day or less<sup>3</sup>.

Table 1 suggests appropriate free stall dimensions for different sizes of dairy cows and these should be used as guidelines for stall assessment.

Even if the stall is desirable, stocking density will influence stall access.

While some degree of over-stocking may be compensated for (estimated up to 1.1 to 1.2 cows per stall), over-stocking to excess will reduce lying times<sup>4</sup> and impact subordinate cows, making them more susceptible to lameness problems.

For lame cows, the stall surface is the key to comfort and rest. The impact of the foot on a firm flat surface during rising and lying movements leads to increased time spent standing in the stall and less time lying in lame cows. In contrast, deep loose

**TABLE 1. RECOMMENDED FREE STALL DIMENSIONS FOR DIFFERENT SIZES OF COW**

STALL DIMENSION (in inches)	BODY WEIGHT ESTIMATE (in pounds)				
	1,000	1,200	1,400	1,600	1,800
Total stall length facing a wall	96	96	108	120	120
Head-to-head platform length	192	192	204	204	216
Distance from rear curb to brisket locator	64	66	68	70	72
Center-to-center stall divider placement (stall width)	44	46	48	50	54
Height of brisket locator above stall surface	3	3	4	4	4
Height of upper edge of bottom divider rail above stall surface	11	11	12	12	12
Height below neck rail	44	46	48	50	52
Horizontal distance between rear edge of neck rail and rear curb	64	66	68	70	72
Rear curb height	8	8	8	8	8
Rear curb width (loose bedded stalls)	6	6	6	6	6

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bedding, such as sand, provides the foot cushion and traction needed during these movements and allows the cow to rise and lie down more easily. This provides the opportunity for lame cows to rest and recuperate<sup>2</sup>.

Lame cows must, therefore, recover in sand bedded stalls, or on a deep bedded pack. Failure to provide for this will result in an increase in the duration of lame events and failure of the hoof lesion to resolve over time.

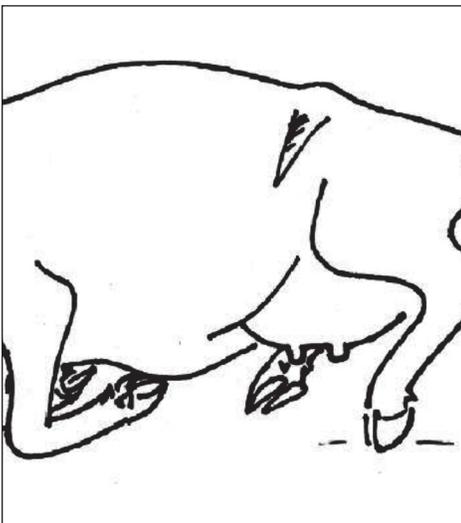


Figure 1. The position of the cow as she rises on a level surface. Note the interaction of one rear foot with the surface before the other rear leg is weight-bearing. A soft giving surface provides cushion and traction at this critical point.

### Poor transitioning

The structure of the claw is weakened around calving time by the action of enzymes on the suspensory apparatus of the third phalanx, probably triggered by hormones such as relaxin. Poor stall comfort, increased numbers of pen moves, over-stocking and competition between heifers and mature cows, may lead to an exacerbation of the natural increase in

standing time that inevitably occurs around calving time.

### Prolonged milking times

It is recommended that all cows are returned to their pen within 45 minutes to one hour of departure for milking. Longer milking times, resulting from poor throughput and/or inadequately sized milking facilities compared to group sizes, in excess of four hours per day, will stress the cow's time budget and erode the time available for rest<sup>5</sup>.

### Heat stress

It is common to see more lameness problems in the late summer months in North America, believed to be due to a combination of increased risk for sub-acute ruminal acidosis, and an increase in standing behavior. Cows that are heat stressed prefer to stand in an attempt to improve heat loss and even under conditions of mild to moderate heat stress, daily standing time may increase by around three hours per day<sup>2</sup>. Heat abatement through the provision of shade, application of fans to move air over the stalls, alleys and parlor holding area, and soaking the cows with water are essential.

### Prolonged lock-up times

It is ironic that the cow most susceptible to prolonged time spent in lock-ups; the fresh cow, is the cow that we restrain the most for daily health checks on farms. Provided daily lock up is limited to around one to two hours, cows may compensate for this loss of resting time. However, lock up times of two hours or more cannot be compensated for and will result in a reduction in resting time per day.

## FACTORS INFLUENCING HOOF WEAR AND TRAUMA

The surface that the cow must stand and walk on may influence lameness in one of three ways—through trauma, wear, and concussion.

■ Surfaces that are excessively rough and uneven may traumatize the sole and the white line, making claw horn lesions more likely. Very slippery surfaces may also traumatize the sole, especially where cows must make sharp turns<sup>2</sup>. The area of the sole most susceptible to trauma is the white line of the outer claw of the rear foot, two-thirds of the way back from the toe, as this is the area of maximum ground reaction force when the cow stands and walks. If the structure of the white line is compromised, it is common to see debris embedded in the sole in this location.

■ Where cows must walk long distances over concrete surfaces, excessive sole wear becomes an issue making the hoof more susceptible to claw horn lesion development<sup>2</sup>.

■ Lame cows are most susceptible to the hardness of the surface. Concussion created by walking on hard unforgiving surfaces makes lame cows in particular modify their gait by reducing stride length and height, and slowing walking speed compared to walking on rubber surfaces<sup>2,5</sup>.

■ While rubber floors have many advantages over concrete for transfer lanes and where cows are forced to stand for long periods — such as holding areas and parlors — they may have some disadvantages when placed in pens with uncomfortable stalls. In this situation, the increased tendency to stand or lie down on the rubber in the alley and spend

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### HOOF AND LEG HYGIENE SCORING

Score at least 20% of the cows in each pen in a free-stall herd or all of the cows in a tie-stall herd.



#### Score 1

Clean, little or no manure contamination of the lower limb.



#### Score 2

Slightly dirty, where the lower limb is lightly splashed with manure.



#### Score 3

Moderately dirty, where there are distinct plaques on the foot, progressing up the limb.



#### Score 4

Very dirty, where there are confluent plaques of caked-on manure on the foot and higher up the lower limb.

Using a 4-point system of leg hygiene scoring, where 1=clean, 2=splashes, 3=plaques but hair visible and 4=plaques and no hair visible, the best free stall herds will have around 25% of cows scoring "too dirty" (scores 3 and 4), with average herds scoring 55%. The limb hygiene scoring system used is shown above.

less time lying in the stall may have negative consequences on herd lameness<sup>2</sup>.

### FACTORS INFLUENCING FOOT AND LEG HYGIENE

Surface hygiene can influence development of infectious lesions due to both presence of bacteria and increased susceptibility to infection when skin is in a moist, low oxygen environment<sup>2</sup>. Therefore, exposure to manure and moisture in the alleys and holding areas should be lessened by maximizing lying times as discussed above and reducing accumulation of manure in these areas by:

- **The frequency of manure removal** Manure should be removed from the pen at least three times per day, preferably when the cows are outside the pen.
- **The mechanism of manure removal** Correctly managed slatted floor pens may improve leg hygiene, but are associated with increased lameness<sup>6</sup>. Automated scrapers operating with the cows still in the pen only serve to coat the foot with manure and increase problems. Therefore, inter-

mittent scraping, vacuum, or flush system manure removal are preferred.

- **The stocking density in the pen** As we increase the number of cows per unit area of pen, we increase the amount of manure the feet are exposed to.
- **The layout of the pen and the width of the alleys** Housing designs that have less alley surface area per cow increase the concentration of manure in the environment.
- **The slope of the alleys** Alleys should slope 1% to 2% to assist drainage of urine and rainfall.
- **The consistency of the manure** High yielding lactating cows have looser manure than non-lactating cows, creating more leg hygiene problems.

### CONCLUSION

The aspects of cow comfort that influence herd lameness are related to increased time spent standing, the nature of the standing surface and the hygiene of that surface. A systematic review of each of these factors is appropriate when presented with a herd lameness problem.

### References

1. Munksgaard, L., M. B. Jensen, L. J. Pedersen, S. W. Hansen, and L. Matthews. 2005. Quantifying behavioral priorities—Effects of time constraints on behaviour of dairy cows, *Bos taurus*. *Appl. Anim. Behav. Sci.* 92:3–14
2. Cook, N. B., and K. V. Nordlund. 2009. The influence of the environment on dairy cow behavior, claw health and herd lameness dynamics. *Vet. J.* 17:360–369.
3. Cook, N.B., Bennett, T.B., Nordlund, K.V., 2004b. Effect of free stall surface on daily activity patterns in dairy cows, with relevance to lameness prevalence. *Journal of Dairy Science* 87, 2912–2922.
4. Fregonesi JA, Tucker CB, Weary DM. Overstocking reduces lying time in dairy cows. *Journal of dairy science.* 2007 Jul 31;90(7):3349–54.
5. Endres, M.I. 2017. The relationship of cow comfort and flooring to lameness disorders in dairy cattle. *Veterinary Clinics of North America: Food Animal Practice* 33: 227–233
6. Frankena K, Somers JG, Schouten WG, Van Stek JV, Metz JH, Stassen EN, Graat EA. The effect of digital lesions and floor type on locomotion score in Dutch dairy cows. *Preventive veterinary medicine.* 2009 Feb 1;88(2):150–7.

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