



Lameness and Laminitis: It's More than Just Nutrition!

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Introduction

With the arrival of fall, some producers have recently started seeing evidence of laminitis in their dairy herds. A paper published in the Journal of Dairy Science reported that laminitis results in lower feed consumption and may decrease milk yields by as much as 6 pounds per day (Rajala-Schultz et. al., 1999). In addition to the loss of milk, lameness also decreases heat expression by cows, resulting in lower reproductive efficiency.

Laminitis results from multiple factors. Specifically, the factors contributing to the occurrence of laminitis in dairy cattle are nutrition, the environment, infection, genetics and animal behavior. These factors all interact and the relative significance of each varies from herd to herd. Troubleshooting problems with laminitis is often frustrating as a result of this variation. Dr. Jose Santos of the UC-Davis College of Veterinary Medicine notes that, **“It is not uncommon to observe a high incidence of foot problems subsequent to a hot summer ... dairy farmers and herdsmen routinely complain about an increase in lameness during the months of August, September and October.”**

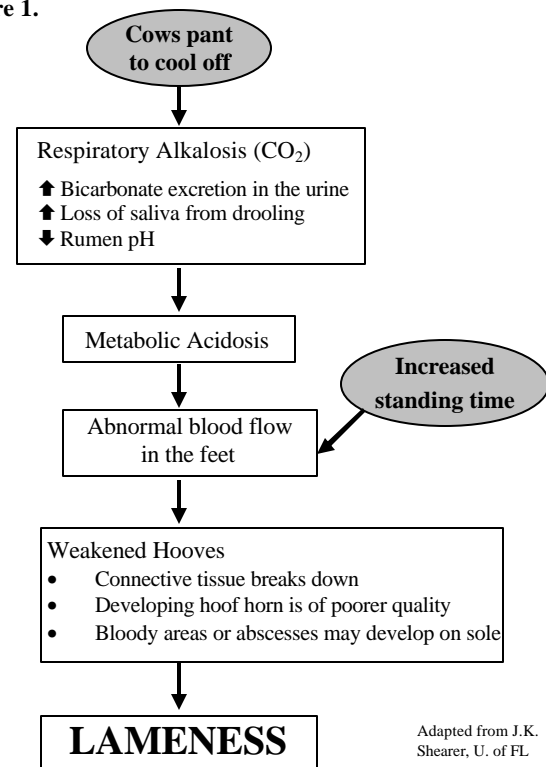
Heat Stress

Cows are most comfortable when environmental temperatures are below 77° F. As temperature and relative humidity increase, animals experience greater degrees of heat stress. Even with mild degrees of heat stress, animals may pant in attempt to dissipate heat, and in doing so experience a condition known as respiratory alkalosis (figure 1). Panting cows chew their cud less and drool more. These factors combine to decrease the amount of salivary buffer (bicarbonate) that is produced and enters the rumen. Furthermore, cows exhale greater amounts of CO₂ when they pant, which in turn elevates their blood pH. In order to maintain proper acid-base balance, cows then increase the amount of bicarbonate that is excreted in their urine. These factors may combine to result in acidosis even though animals are fed a “nutritionally safe” ration.

Cows also stand more when heat stressed because it is easier for them to pant effectively when standing. They can exchange a greater volume of air and therefore cool off more effectively when standing versus lying down. Depending on the facilities, ventilation and airflow are often better for cows if they remain standing. Unfortunately, increased standing time results in more foot problems and lameness (figure 2).

How do we avoid such problems? Most importantly, **minimize heat stress** by providing a cool, comfortable, well-ventilated environment with adequate access to feed water, and bedding areas so that animals are not standing for excessive periods and are maintaining normal eating patterns. Also, by providing adequate amounts of dietary potassium and sodium, animals may improve their acid-base status as the buffering capacity of the rumen and blood is restored.

Figure 1.



Adapted from J.K. Shearer, U. of FL

Housing

One of the primary factors believed to contribute to the development of laminitis is the amount of time cows spend standing (figure 2), particularly if they are standing on concrete. As mentioned above, increased standing time increases the number of clinical lameness cases. Dr. Charles Guard of Cornell University notes that when cows stand on concrete, “pressure [is] exerted on specific portions of the claw [and] may contribute to the observed vascular-derived lesions of either hemorrhage or necrosis. In addition to time spent standing, if the claws are not properly trimmed, localized pressure may contribute to further foot damage.”

Time spent standing is highly influenced by facility design. When evaluating the quality of free stall design, Dr. Jim Nocek notes that animals must be able to:

- Enter and leave the stall easily
- Lie down and rise without interference from partitions and other animals
- Stand or lie comfortably in the stall.

These factors combine to influence stall usage. If stall usage is unacceptable, producers should determine if there is a lack of bedding or padding for comfort, dimensions are incorrect, or especially in the case of hot weather, if ventilation and air quality in the stalls are poor. In addition to stall design, producers should evaluate if overcrowding is preventing subordinate animals (usually heifers) from accessing feed or even resting. Such animals are probably standing for excessive periods and may also be “slug feeding,” a situation that may lead to unstable rumen fermentation and possibly large fluctuations in rumen pH.

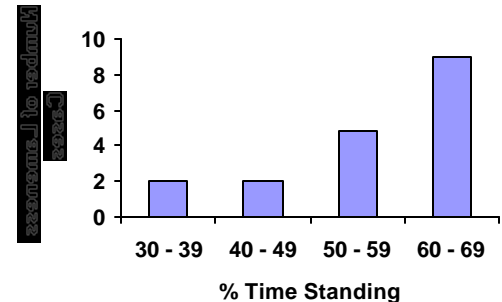
Nutrition

Proper nutritional management is widely understood to be a key component in minimizing the incidence of subclinical acidosis that may contribute to the development of laminitis. The most common risk factors are diets containing high concentrations of non-fiber carbohydrates (NFC) and low concentrations of forage and/or fiber.

Although improper nutrition clearly may contribute to laminitis, in and of itself it is not the only factor. In a paper published in *The Progressive Dairyman* (March 2001) investigators sampled TMR and weigh-back samples weekly in three large California dairy herds that had a high incidence of lameness (20 – 30%). Concentrations of neutral detergent fiber (NDF) and NFC were adequate in all rations (NDF > 30% and NFC < 38%). Ration particle size distribution was also acceptable in all herds (8 - 12 percent greater than ¾ inches). The investigators noted that even though these rations were believed to be “nutritionally safe,” white line separation, sole ulcers, and abscesses remained a constant problem. These observations lead the investigators to believe that **proper management of factors other than carbohydrate availability and diet particle size distribution may be extremely important for lameness prevention** (Santos and Overton, 2001).

Without question, laminitis is a significant problem on many U.S. dairies. Producers need to remember, however, that while nutrition is often a significant contributing factor, it is rarely, if ever the sole cause of foot health problems. In fact, in many herds that are just now starting to see evidence of laminitis, the primary cause can likely be traced to the heat stress cows began experiencing back in July.

Figure 2. Effect of Standing Time on Number of Lameness Cases



Galindo and Broom, 1994