

## Laminitis

Laminitis is the most common noninfectious foot condition of cattle. Management practices adopted to increase production also tend to encourage laminitis. It is unlikely that a high producing herd will eliminate the problem of laminitis but it is a realistic goal to decrease the occurrence to 3 to 5% of cows over a 12 month period.

What is laminitis?

The foot of a cow is similar to the tip of a human finger so that all the force of a dairy cow's weight is directed down through the last digit. The hoof wall, similar to our fingernail, is nonliving tissue produced by very active cells with a rich blood supply. The last bony digit, or coffin bone, is encased below these layers of horn tissue. Horn of a softer consistency is also grown from the bottom of the foot (the sole), and from the bulbs of the heel (heel horn). The foot problems representing "laminitis" in cattle include noninfectious damage to laminar and papillar horn-growing tissues, resulting in horn abnormalities of the wall, sole and heel horn tissues.

Damage to the vascular horn-growing tissues (corium) of the bovine foot will be reflected by abnormal horn growth with or without lameness. Routine evaluation of foot conformation and horn abnormalities can be very useful in assessing the effects of management and the occurrence of laminitis, independent of the development of clinical lameness. Furthermore, routine foot trimming to correct abnormal horn growth can minimize the occurrence of some forms of lameness that result from laminitis. The corium (vascular horn-growing tissues) can be damaged by changes in the local blood supply, local trauma, or local inflammatory processes. The causes for these injuries are listed in Table 1.

In the normal bovine foot, the heel tends to grow more quickly than the toe, probably in response to the higher level of abrasion and concussion that the heel sustains with normal walking. Thus, the lines of the hoof wall tend to get more widely separated toward the heel than around the toe. When some insults occur, the response of the corium depends on the severity and duration of the insult. Low grade, chronic irritations tend to result in overproduction of horn, which is an appropriate response, similar to the development of calluses on a human hand. In contrast, low-grade foot infection and inflammation can encourage exuberant horn growth and changes in the conformation of the foot. Acute, severe insults such as acute trauma or endotoxin-induced vascular damage can cause hemorrhaging of the corium and an abrupt cessation of horn growth. These changes can be seen as bloody discoloration of the horn when the horn grows out to a more superficial location, or as horn that separates from the newly growing, underlying layers.

How is laminitis recognized?

The different forms of laminitis are recognized by their different clinical manifestations. The first three types of laminitis are less frequent than the fourth, sub clinical laminitis.

\* Acute laminitis results in swelling and bleeding of the tissue. Swollen corium entrapped within the hoof wall can be very painful resulting in lameness in more than one foot, but without visual changes in confirmation of the hoof wall or sole. The foot will probably be warm and the pulses in the lower limb arteries prominent.

\* Sub acute laminitis refers to the continuation of this painful foot problem beyond several days of time. Typically, acute and sub acute laminitis will occur very promptly after the onset of another disease process such as acute ruminal acidosis.

\* Chronic laminitis describes gross deformity of the hoof wall, which occurs months after a bout of acute or sub acute laminitis, without lameness.

\* Sub clinical laminitis refers to an insidious problem. Although hoof wall growth occurs abnormally over a prolonged period, lameness is not recognized. Rather, the cow is predisposed to foot lesions that result in lameness. (Table 2) Sub clinical laminitis can be identified prior to the onset of lameness by inspection of the horny hoof tissue looking for hemorrhage in the sole tissue and a yellow discoloration of the sole horn associated with softer than normal sole horn. These changes will first be seen two to three months after the initial injury, when the affected horn has grown to the more superficial layers.

How can we control or minimize laminitis?

No single corrective action can successfully decrease the incidence of laminitis in a dairy herd. Because of the multifactorial nature of the problem, a monitoring process is the foundation for a strategy to reduce laminitis to less than 5% of the herd over a 12 month period. A routine evaluation of cow foot health should be conducted on both lame and sound animals.

Specific risk factors for laminitis can be monitored and management adjusted:

1. Appropriate nutritional management adjusted to specifically prevent ruminal acidosis. Risk factors, in this regard, include high levels of concentrate or nonstructural carbohydrate feeding, low levels of structural fiber feed components, fine grinding of fibrous feeds, inadequate use of feed grade buffers, and rapid changes from a dry cow to a high production cow ration. Routine monitoring of rumen fluid pH in different production groups could be used to evaluate management.

2. Poor foot and limb conformation should be remedied. Although excessive body weight, small claw size, and abnormal limb angulation may be genetically determined, they may be managed with diet and preventive foot trimming to maintain normal weight bearing on a sound claw. 3. Cow behavior can play an important role in sub clinical laminitis.

Exercise is very important for the maintenance of normal blood flow through the foot, but appropriate rest is also required for cows that spend time on hard concrete flooring surfaces. Provision of adequate stall space, design of comfortable stalls, and avoidance of competition between adult dominant cows and younger replacement heifers can influence the occurrence of laminitis-related foot problems. The simple provision of increased

bedding in the stalls to encourage the cows to spend more time resting and ruminating can reduce foot problems.

4. Foot environment is critically important. A constantly wet or contaminated foot environment can encourage low-grade foot inflammation and lead to abnormal hoof growth and abnormal weight bearing.

Table 1 . Types of Damage to Bovine Horn-Growing Tissue

Type    Disease Example

1. Inflammatory Damage to Blood Vessels    Rumen Acidosis, mastitis, metritis,

2. Metabolic Changes Pregnancy, Systemic illness

3. Trauma    Poor hoof trimming methods, abrasive

floorings, inadequate rest time

4. Inflammation    Systemic inflammatory disease or localized infections

Table 2. Secondary foot problems associated with Sub clinical Laminitis

1. Sole ulcers

2. White line Disease

3. Heel erosions

4. Bruised soles

5. Sole Abscesses

6. Toe ulcers

7. Wall cracks

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