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Lameness in dairy cattle

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LAMENESS IN DAIRY CATTLE

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Summary

Foot problems are major concerns for dairies, and care should be taken to avoid promoting them. Preventive measures, with the aid of a veterinarian, must be followed if the problem is expected to be controlled. Feet should be trimmed or at least observed one to two times per year. High concentrate diets should be fed carefully to avoid acidosis. Cows should have limited time standing on concrete and should not be rushed when walking on any abrasive surfaces. Cows need a clean, comfortable environment in which to lie down. Lamé cows need treatment early, and records should be kept on all cases.

(Key Words: Hoof Health, Lameness, Foot Rot.)

Introduction

Feet and leg problems in cows are major health concerns for many dairy farmers. Lameness results in poor performance and substantial economic loss. Nutrition and feeding, housing and environment, concurrent disease, genetic influences, and management factors can predispose cows to foot problems. The greatest incidence (90%) of lameness involves the foot, and of these, 90% involve the rear feet. The most frequent causes of lameness are: laminitis, claw disease, digital dermatitis, and foot rot. Because individual cows often have more than one cause for lameness at the same time, understanding the different types of lameness as well as the treatment and prevention protocols is important.

In 1995, the incidence of clinical lameness in cows was 35% for Florida Dairy Herd Improvement (DHI) herds. Claw problems (sole

ulcers and white line disease) accounted for 63% of the reported cases. Digital dermatitis and foot rot accounted for 20% and 17% of the cases, respectively.

Tracking Lameness Problems

Record all lameness problems on the dairy. Use a form provided by your veterinarian for proper evaluation and diagnosis of each case. A case is considered to be new, even in a previously lame cow, if it occurs 28 days after a previous incident.

Economics

Economically, the results of foot disease are much greater than the treatment costs. Reduced milk yields, lower reproductive performance, increased involuntary culling, discarded milk, and additional labor costs account for the largest monetary losses. Studies in New York have shown lameness to be one of the most expensive health problems, at a cost of \$90 per cow. Cows with feet problems are usually the same cows subsequently treated for mastitis or reproductive and other health problems. Keeping records on these cows and culling persistent problem cows may be advantageous.

Anatomy

Anatomical deformities can lead to an increased rate of lameness. Ideally, the conformation of the cow's foot should be short, steeply angled, high in the heel, and even clawed. The sole should be somewhat concave, with the majority of the weight placed over the hoof wall. Overly straight hocks, weak pasterns, sickle hocks, splay toes, or overlapping toes commonly are observed with

an increase in the rate of lameness. Genetically, these traits have a low heritability in Holsteins ($h^2=.08$ to $.16$), so it is not a reliable tool for selection. When possible, select sires based on progeny tests. Phenotypically, the feet and legs of sires should be structurally correct to increase longevity of his daughters in the herd.

Outside claws of the cow's rear legs bear the burden of the continuously changing weight load, and this may be the reason they are damaged more often. The front feet are different in that they bear weight changes more evenly, and when problems do occur, the inside claw usually is affected. The cow's foot is protected by the hoof and its outer structures that do more than just bear weight. The hoof tissue is the first line of defense preventing foreign objects and pathogens from entering the area beneath the hoof, which is the nerve and blood-rich area called the corium (quick) or dermas that produces the hoof horn (wall). The health of the corium establishes the quality of the hoof horn produced. Laminitis, which impairs the health and function of the corium tissues, reduces the quality of the hoof horn formed and, thus, impairs its function. The coffin bone, sometimes affected by laminitis, is suspended within the corium; damage to this bone leads to other problems. The hoof wall is formed at the coronary band (a pink line near the top of the hoof that may appear soft and shiny) and grows at a rate of .2 inches per mo. The area where skin meets hoof is called the periople and, in the back of the hoof, makes up the horn of the heel. The sole is a separate structure made up of underlying corium (touching the ground). The boundary where the sole meets the hoof wall is called the white line. This line may not always appear white but does separate sensitive from nonsensitive hoof, with the area nearer the center being sensitive. This white line also is an important landmark, because it is soft and can be penetrated easily by foreign objects.

Hoof Trimming

Hooves should be trimmed or evaluated once or twice yearly to improve comfort and performance. One of the trimmings should be scheduled early in the dry period. Proper

weight bearing on the hoof wall of the inside claw of the front feet and the outside claw of the back feet is especially important. Hoof trimming is stressful for cows. A 10% reduction in milk yield may occur after trimming. However, regular claw trimming may increase longevity of cows by one complete lactation.

Nutrition

Proper nutrition can reduce the number of foot problems. Most lameness problems occur within the first 100 days in milk. Furthermore, laminitis and other causes of lameness can depress feed intake and predispose cows to ketosis, abomasal displacement, and other metabolic disorders. Laminitis often is a result of poor nutrition, but usually no single factor can be blamed. A wide range of variables has been associated with laminitis including: metabolic and digestive disorders; stress associated with parturition; mastitis; metritis; hard or poorly bedded stalls; too little exercise; excessive bodyweight; and poor nutritional management.

Rations that cause acidosis are associated with laminitis. This problem is difficult to manage, because the largest percentage of diets fed to dairy cattle contain concentrates. Fiber, measured using neutral detergent fiber (NDF) and acid detergent fiber (ADF) values, must be at sufficient concentrations and have the right physical form and particle size. Increased particle size increases cud chewing and, therefore, increases saliva production and aids in efficient digestion. Silage should be chopped so that 25% of the particles on a weight basis are over 2 inches long.

Depending on the grain source, the non-structural carbohydrates should not exceed 40 to 45% of the ration. Grains also must be processed properly to minimize ruminal upsets and maximize starch digestion. Feeding low NDF (below 27% of the ration dry matter) can predispose cows to lameness, metabolic disorders, and overall poor performance. At the very least, ADF should represent 21% of the dry matter fed. Feeding mature hay may be beneficial during times of high risk, because immature forages often do not provide enough fiber.

Having two feeding groups of dry cows can help implement transition rations. Cows expected to calve within 3 wk should be changed to a new diet to help alleviate ruminal stress at parturition. When cows freshen, do not move them quickly to a high grain diet. Even though cows are in a negative energy balance, make a gradual transition. As a preventive measure, all cattle should have rations balanced for calcium, phosphorus, and vitamins A and D for good bone and tissue health. Other helpful nutrient supplementation can come from zinc, copper, molybdenum, manganese, vitamin E, and biotin.

Further preventive measures to reduce acidosis and periparturient diseases include:

- ✓ Feed high energy rations with a buffer (especially in early lactation).
- ✓ Allow 2 ft per cow at the feedline.
- ✓ Provide a continuous supply of fresh feed to prevent slug feeding.
- ✓ Provide a comfortable environment to encourage cows to lie down for a minimum of 10 to 12 hr per day.
- ✓ Limit time cows spend standing in holding pens to no more than 3 hr per day.

Because nutrition plays a significant role in foot disorders, changes in the normal pattern of ruminal fermentation tremendously influence claw health. Feed a total mixed ration (TMR) to regulate concentrate-to-forage ratio. Closely observe changes in forage moisture content and modify rations accordingly. Successful feeding programs will maximize feed intake and minimize acidosis, while maximizing energy intake during early lactation.

Housing and Environment

Dairy cattle confined to concrete may have more foot and leg problems. Properly designed and bedded free stalls will encourage cows to lie down. Curb height over 6 inches should be avoided. Cows lying down for more than 10 hr are more content and have fewer claw problems. The number of free stalls should be 10%

more than the total number of cows. Watch for behavioral changes caused by heat stress and flies and implement measures to reduce their effects. Providing time for cows to be on dirt or pasture may reduce lameness.

Movement of cows at a fast pace on rough or hard surfaces increases the incidence of lameness. Allow cows to go single file at their own pace to reduce foot abrasions. Wet concrete is 83% more abrasive than dry concrete, and new concrete is more abrasive than old, so special care should be taken when moving cows are on these surfaces. Grooving smooth concrete may be worth the cost in reducing lameness. Rubber mats placed in feedlines and traffic lanes also may prove beneficial.

Laminitis and Association with Claw Disease

Confinement of cows to hard surfaces alone can cause laminitis and claw disease, especially if cows were changed from dirt or pasture to concrete. The outside (lateral) claw of the rear feet and the inside claws of the front feet are affected most often by laminitis. Laminitis or founder is caused by a disturbance in blood flow in the corium that leads to a breakdown of the dermal-epidermal junction of the hoof. This is followed by laminar separation that allows the coffin bone in the foot to become misplaced, which compresses soft tissues and sets the stage for sole or toe ulcers (perforations). The lamina is the sensitive, hoof-tissue-secreting portion of the hoof that becomes inflamed, hence the name, laminitis. Cell death of the corium tissues (necrosis), hemorrhage (bleeding), and edema (swelling) especially of the corium follow laminitis.

Inflammation from laminitis has many causes such as metritis and mastitis, but acidosis is the leading predisposing factor by disrupting the blood supply and its contents to the foot. Clinical signs are observed in calves fed a diet too high in concentrate at 6 mo of age. This opens the door for more severe laminitis as the animal grows older.

Cattle with chronic laminitis (slipper foot) usually have overgrown, disfigured hooves. The coronary band is covered with a rough

fringe of horn, and the hoof appears rippled. Because the outside claw of the rear foot is affected most often, cows tend to stand cow-hocked. Abnormal growth in chronic cows may lead to abnormal wear that predisposes the cow to many other lameness problems, such as sole ulcers, white line disease, and abscesses.

Sole ulcers, resulting from necrosis, expose the corium and can debilitate the cow. Maturity of the lesion may determine the ulcer's appearance. Together, excessive hoof-horn formation, movement of the coffin bone, and the production of softer sole horn predispose the outside claw to tremendous weight bearing and wear. This lesion occurs because of the increased pressure placed on the heel, and cows often are seen standing with their legs further back than normal. The pain and pressure of the ulcer can be helped with footblocks or shoes applied to the good claw. Never bandage or cut the ulcer or apply anything that will burn the granulation tissue and delay healing. If an ulcer is found in one outside hind claw, the other hind foot likely contains an ulcer, too. The incidence of sole ulcers can be reduced with regular foot trimming, because even weight distribution on the claws is maintained. Toe ulcers are ruptures of the white line caused by the toe bone (coffin) rotating. A ridge may be seen on the wall several months after change to a high concentrate diet. Animals with toe ulcers should not be used for breeding purposes and will be impaired for life.

Hemorrhage and necrosis of the corium are seen most often in the white line, the weight-bearing region of the sole or claw. The hemorrhage is not visible until it rises to the surface of the sole after a few weeks, indicating subclinical laminitis. Subclinical laminitis often is not noticed until after repeated episodes have occurred and it reaches the chronic form. If greater than 10% of mature cows are showing some signs of lameness in a 12-mo period and foot rot or digital dermatitis has been ruled out, then subclinical laminitis may be present. In addition, if 5% or more of the cows are experiencing sole ulcers in a time frame of 12 mo or less, subclinical laminitis may be present.

Cattle also may get what is called by many "white line disease" or subsolar abscesses that can cause acute lameness. Acute laminitis also is caused by grain overload. With white line disease, an abscess will occur in the heel, leading to severe destruction of the joints and tendons. This often is confused with foot rot, but the swelling is confined to the heel of a single claw not in both claws as with foot rot. Often, acutely lame cows show pain in all feet and stand with their front or hind feet extended forward. Abscesses are caused more commonly by laminitis, because the white line is widened and softer and thus more penetrable. Laminitis also is associated with other diseases. Double soles, heel erosion, horizontal grooves and fissures, and vertical fissures (sandcracks) can occur.

Prevention of laminitis can be accomplished best by reducing ruminal acidosis and controlling periparturient diseases such as metritis and mastitis (see Nutrition section). There is no specific treatment for laminitis, but nonsteroidal, anti-inflammatory drugs are used to control the pain. Hoof over-growth is treated by continuous trimming. Ulcers and abscesses are treated by exposing the damaged area and allowing drainage.

Digital Dermatitis

Foot warts are known by a variety of names including: hairy heel warts; digital warts; strawberry foot; raspberry heel; verrucous dermatitis; digital warts; interdigital papillomatosis; Mortellari or Mortellaro's disease; and digital dermatitis, which is the most accepted term. Although this is a disease associated with infection, predisposing factors are unknown and its incidence is increasing worldwide, making this a difficult health problem to control. Some closed herds have never developed the disease.

The earliest lesion detectable as digital dermatitis is a reddened circumscribed area typically on the bottom of the pastern (just above the division of the toes around the heels) on the rear feet; it may have hairs matted or erect around the edges to form a rim. This extremely painful disease can be seen occasionally in the front feet or on the front of the rear

feet. Cows may stand on their 'tip toes' while trying to relieve the pain of weight on the heels. Purchased cattle (especially bulls) should be examined thoroughly, and if the disease is diagnosed, treatment should follow immediately.

Topical sprays are the least expensive treatment; can be applied directly; have less chance for contamination; and have less chance for residue but may be less effective than other treatments. Cleaning the area before topical sprays are applied is helpful, because the antibiotic is more effective if manure and other debris are removed. Use of antibiotics in treatment is an extra-label use. Consult with your veterinarian for specific implications. To control the disease, keep the herd as closed as possible. Footbaths are somewhat effective. Incidence of the disease is much more common in newly purchased cattle than in existing cows. This indicates that some immunity may exist for cattle previously exposed to the disease.

Foot Rot

Foot rot is a contagious, infective disease most often detected in confinement cattle. It is characterized by a necrotic, foul smelling lesion in the interdigital skin (between the claws) that may extend into the soft tissues of the foot, causing swelling and lameness. The organism

thought to be responsible for foot rot (*Fusobacterium necrophorum*) originates in the gastrointestinal tract and is shed into the environment by feces. This bacterium can live freely in the soil or in the internal environment of the animal. A new, more severe form of the disease has been observed recently that may reach the upper leg and, if not treated immediately, has a grave prognosis for infected animals.

Reducing foot rot can be accomplished by housing cattle in dry, manure-free pens that have no debris. Other preventive measures include: footbaths, feed additives, and/or vaccines. Damaging factors leading to foot rot include: stubble fields, small rocks, abrasive surfaces, and high temperatures with high humidity. Isolating infected cattle may reduce the spread of the bacteria to the environment.

Treatment with injectable antibiotics has been successful with or without topical treatment of the wound. Other causes are likely present if the cattle have not responded after 3 days of treatment. The lesion should not be covered or bandaged, and the animal should be housed in a dry, clean environment to promote healing. Other diseases associated with infection besides digital dermatitis and foot rot include infection of the coffin joint and interdigital dermatitis (stable foot rot or scald).