

Preventing Hoof Problems for Dairy and Beef Cattle

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Lameness is a major health problem that causes tremendous economic losses primarily in dairy cattle but it can also affect beef cattle. Lamé cows lose weight and body conditioning. Milk production is lowered because they do not go to the feed bunk as often. In most dairy herds, the primary cause of lameness is claw disorders associated with laminitis (founder). Early detection and prompt treatment minimizes losses, improves recovery, and reduces animal suffering.

A three-year dairy study in England and Wales found an average of 55 cases of lameness per 100 cows each year. Lesions causing lameness were found in the feet of 99 percent of cases, with 92 percent in the rear feet. Lesions in the rear feet were found more often on the outside claw. White line disease and sole ulcers accounted for 58 percent of all lesions. Costs due to clinical lameness are estimated to be around \$300 per case. Sole ulcers are the most costly, with an estimated cost at over \$600 per case.

Anatomy

The hoof grows from the coronary band at a rate of 1/4 inch per month. The hoof is composed of the outer wall, white line, sole and heels. The outer claw of the rear foot grows faster than the inner claw; the inner claw grows faster on the front foot. It is important for the wall to withstand stress yet be able to move slightly in order to function as a shock absorber. The heel (bulb) responds to stress and weight by compression.

The laminae help reduce the impact within the hoof wall. The laminae (structures within the hoof that look like slanting lines or fish gills) are part of the corium which is rich in blood vessels and nerves. The corium (or quick) is positioned between the foot bone and the hoof wall; it is vulnerable to inflammation which leads to swelling causing pressure, pain, and tissue damage in the corium (laminitis). On the underside of the foot, the sole is formed by the corium, and the junction of the hoof wall and sole is seen as a white line. The softer tissue at the white line is a weak spot in the hoof that is subject to penetration by stones or grit.

The corium produces the hoof horn and sole. The healthier the corium, the better the hoof horn produced. Diseases such as laminitis reduce the integrity of hoof horn formed and do not protect the foot or support the body weight as well. Beneath the corium lies the pedal (coffin) bone. The pedal bone is surrounded by and suspended within the corium. The pedal bone is separated from the hoof wall by a very thin layer of corium. It is very easy for the pedal bone to pinch the blood vessels and nerves of the corium when too much pressure is placed on the heels.

Laminitis

Laminitis is characterized by edema, hemorrhage, and cell death in corium tissues. This destruction can also cause separation of corium layers, allowing the pedal bone to compress the corium and cause sole ulcers. Ulcers may form near the toes but more typically will form at the heel. Sole ulcers are described as a localized loss of the horny sole, exposing the corium. They tend to be one of the most debilitating types of lameness and can lead to infections of the deep tissues of the digit. Treatment requires removal of dead or dying tissue, followed by elevation of the affected claw with a foot block attached to the unaffected claw. All healthy horn tissue should be left in place.

Another problem caused by laminitis is hemorrhage and disrupted blood flow to the corium. This change in blood flow can kill corium tissue and occasionally form an abscess. These abscesses often occur at the white line and cause acute lameness. Abscesses also form due to penetration of the white line by foreign material. Distorted hoof growth and separation of hoof layers caused by laminitis widen the white line. In addition, hoof horn formed by the diseased corium is softer, thinner, and more subject to damage. These two factors create a greater risk of penetration. For treatment, the site should be carefully cut out until the abscess drains. Be sure to minimize damage to the surrounding corium tissue; once damaged, it loses the ability to produce horn tissue. The hoof wall adjacent to the abscessed area should also be removed to minimize weight bearing at the site.

Laminitis leads to accelerated hoof growth of walls and long toes. As the cow's toes begin to grow out, her weight becomes distributed to the back of her heels. This posture stance in the rear legs leads to being "cow hocked". An abnormal cow will toe-out in the rear feet and her weight will no longer be evenly distributed over all four claws.

Lesions of the foot that are most characteristic of the subclinical laminitis condition include:

1. Visible hemorrhages of the sole that may appear as pink staining of the hoof horn or hemorrhages arranged in the form of striations.
2. Hoof horn particularly soft, yellowish, and/or waxy in appearance that cuts readily with a hoof knife.
3. An increased incidence of toe ulcers and sole abscesses.

Confinement, Concrete and Cow Comfort

Cows are not adapted to standing on hard, abrasive surfaces. Confinement on hard surfaces increases the weight load on feet, while housing on earthen surfaces reduces these effects. The hard surfaces tend to irritate the corium and accelerate hoof growth. Overgrowth can lead to overloading of the affected claws and a greater risk of claw disease. Confinement restricts exercise, resulting in weak pasterns and wide spread claws.

A variety of housing and management factors appear to influence the amount of time cows spend standing versus resting. Obvious considerations are number of stalls, stall design, and amount of bedding. The incidence of lameness tends to be higher in free stalls than straw yards. Excessive curb height (over 6 inches), inadequate bedding, and insufficient lunge space have all been linked to greater herd lameness.

Research has shown that cattle allowed to walk in single file have fewer cases of lameness than those rushed to the parlor and back. Cows should be allowed to move at their own pace over hard and rough surfaces. Moving at the herdperson's pace causes more foot problems, as well as injuries from falling or slipping.

Concrete is capable of creating an extremely abrasive surface for cows' hooves. New concrete is more harsh than old; wet concrete is more abrasive than dry concrete. Animals on wet concrete suffer doubly because the moisture also softens the hoof horn and encourages faster wear. On the other hand, smooth concrete reduces wear and contributes to hoof overgrowth. Grooving the surface of smooth concrete floors increases traction; it is well worth the expense.

The best preventive care for the bovine foot is to allow cows to leave the concrete and exercise on dry lots or pasture for two to three hours per day. The dirt offers more cushioning support than concrete and eases the pressure on joints, tendons, and ligaments in the legs. Unfortunately, exercise lots have a tendency to become muddy during high rainfall. Moisture can soften the horn and lead to heel erosion.

Heat Stress

Cows will normally produce 5 to 6 pounds of sodium bicarbonate per day if they are able to rest and chew their cud. The thermal comfort zone for dairy cattle is between 41° F and 78° F. When it becomes too hot, cows lose saliva through panting and drooling. Cows do not ruminate as much and are not lying down when hot. Their increased respiratory rate leads to a respiratory alkalosis. The cow's body responds by increasing urinary output of bicarbonate. This all can contribute to rumen acidosis since there is less bicarbonate available to buffer.

During periods of hot weather most dairies attempt to increase the nutrient density (increasing the concentrate to forage ratio of diets) of rations as a means of maintaining dry matter intake. This needs to be monitored carefully, because heat stressed cattle tend to eat less frequently (more during the cooler times of the day) but more at each feeding. The combined effect of the rations, feeding patterns, and respiratory alkalosis increases the risk for rumen acidosis and laminitis in hot weather. Research in Florida indicates that the majority of lameness occurs in June through November, most likely associated with the effects of heat stress.

Total mixed ration (TMR) feeding has evolved as one method to lower the risk of laminitis in dairy cattle. However, unless appropriately formulated with good quality forages, carefully mixed, and properly delivered, most if not all of the benefits of TMRs (with

respect to hoof health) can be lost. Hay and ensiled feeds should be chopped as coarse as possible and not overmixed to the extent that effective fiber attributes are lost. The addition of sodium bicarbonate to the ration will aid in the reduction of rumen acidosis and may be helpful. Measures to reduce heat stress and encourage consistent feed intake throughout the day will minimize production losses as well as limit potential for lactic acidosis.

Hoof Trimming

Proper foot trimming is the only means to correct the problems of overgrown claws. Trimming should be done two to three times per year in the dairy herd by a professional foot trimmer. For the herd, regular preventive foot trimming reduces lameness problems because subsequent claw diseases are prevented by promoting proper loading as well as detecting lesions at an earlier stage. The ideal time is during mid lactation (100 to 150 days in milk). Dry off is another common time for trimming; cows usually are removed from the concrete confinement to pasture during the dry period.

Every farm needs appropriate foot restraint and positioning on the farm to immediately care for the lame cow.

The objectives of foot trimming should be:

1. Shorten the toe and lower the outside of the hoof wall and sole so that the body weight is shifted from the bulbs of the heel to the toe and outside hoof wall.
2. Scoop out the soles so that the weight is put back on the outside walls and not on the soles.
3. Balance the heels. Each hoof should have the same depth of heel and hoof wall appearance.