Lameness in Cow/Calf and Feedyard Cattle

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Lameness in Cow/Calf Operations

The incidence of lameness in beef cows on pasture is generally quite low. Grass pastures are normal walking surfaces for cattle. They provide comfortable forgiving footing that offers traction, thus preventing injuries from slips and falls. Softer walking surfaces also reduce the mechanical factors that encourage claw horn overgrowth and altered weight-bearing that are important predisposing causes of lameness for animals housed on concrete.

When lameness does occur in cow/calf systems it tends to affect the upper leg (above the fetlock joint). The following outline provides a convenient listing of the common disorders observed in cattle.

• Primary lameness disorders in beef cows and bulls
  – Proximal (upper) Limb
    • Injuries – caused by mounting, fighting, transport, handling, loading and unloading, slips and falls, and other forms of trauma
      – Fractures (spine, hip, long bones)
      – Subluxations (hip and scapulo-humeral joint)
      – ACL tears, meniscus damage, muscle tears, medial and lateral collateral ligaments
    • Neuropathies (calving-related, developmental, injection sites)
    • Degenerative joint disease (arthritis – septic and non-septic)
    • Tendonitis and tenosynovitis
    • Heritable, genetic, developmental, etc.
      – Conformational problems (cow-hocked, post-legged, carpal or tarsal valgus/varus)
  – Foot Problems (includes the lameness of the fetlock and below)
    • Infectious conditions
      – Foot rot, digital dermatitis, heel horn erosion, interdigital dermatitis
    • Metabolic and Mechanical
      – Ulcers, white line disease, foreign bodies, thinning of the sole, toe lesions
    • Heritable, genetic, developmental, etc.
      – Vertical and horizontal wall cracks
      – Screw claw
Lameness in Feedlot Cattle

Dr. Dee Griffin reviewed records from five western feedlots and found that of 13% of 1,843,652 animals treated for health problems, lameness accounted for 16% of health disorders treated and 5% of deaths. He further reported that lameness accounted for 70% of all sales of non-performing cattle and that the salvage value of these animals was only 53% of the original purchase price. In contrast to lameness observed in cow/calf operations, 70% of lameness disorders involved foot problems, 15% upper leg conditions, 12% septic joints and 3% injection site lesions. Foot problems were primarily due to mechanical injuries from handling equipment, foot rot and traumatic lesions of the sole from excessive wear.

Most cattle are pulled for limping or lameness, given a diagnosis of foot rot and treated with a long-acting antibiotic or combination of antibiotics. A primary reason for this is the difficulty associated with examining and treating a foot in the traditional restraint facilities popularly used in feedyards. This antibiotic treatment strategy normally results in a lengthy withdrawal period. Observation indicates that less than 10% of lameness in feedlot cattle is actually due to foot rot. Few operations are aware of the costs incurred from an inaccurate diagnosis and treatment of a condition for which antibiotic therapy is unlikely to be effective (deep digital sepsis conditions, certain injuries, white line disease, toe lesions and more). Beyond being ineffective and costly is the concern that these types of treatment practices risk increasingly greater scrutiny regarding drug use in livestock production.

Lameness in feedlot cattle is a serious economic and animal welfare problem. There are many causes of lameness in feeder cattle, but disorders of the foot including foot rot, injury caused by foreign bodies, white line disease abscesses, toe abscesses and traumatic lesions of the digit constitute 70% of the lesions observed. As with any disease disorder, when these problems are detected early and treated promptly suffering and economic loss are minimized. It is also true that delayed treatment results in prolonged suffering and the potential for even minor conditions to progress to the point at which potential for recovery is jeopardized.

Examination and treatment of foot disorders requires good restraint. Herein is a major drawback to implementing proper care of foot disorders in feedyard settings - as good as most restraint systems are for the purposes of processing calves, they are woefully inadequate when it comes to efficient examination and treatment of foot conditions. This deters hospital crews as well as veterinarians from having an interest in proper examination of foot problems in feedyard cattle. The ability to properly care for foot problems is also complicated by a lack of good equipment or the fact that existing equipment is poorly maintained (i.e. hoof knives are dull). Knife sharpening, like foot care, requires access to the proper equipment and an understanding of knife sharpening techniques.

Foot care practices have advanced significantly in the past 10 years. Current understanding of foot problems indicates that the injection of a long-acting antibiotic is not likely an effective therapy for anything more than foot rot or injuries, and only then when they are detected early. The most effective therapies for foot problems are corrective trimming and the use of foot blocks to relieve weight bearing on injured claws. Thus, a sharp hoof knife, a good set of nippers and an angle grinder with a proper set of wheels are real assets in foot care for feedlot cattle.
Infectious Disorders of the Foot and Foot Skin

Infectious disorders of the foot and foot skin of greatest importance are foot rot and in recent times, digital dermatitis. Foot rot is normally responsive to antibiotic therapy if the condition is detected early. Digital dermatitis is also responsive to antibiotic therapy, particularly when applied topically; but the improvement is often short-lived.

Foot rot (Interdigital Phlegmon)

Foot rot is an infectious disease of the interdigital skin characterized by the presence of an interdigital lesion, swelling, and moderate to severe lameness. Fever ranging from 103-105°F (occasionally higher) is a consistent finding during the acute stages. Although evidence is inconclusive, most believe that footrot develops following injury or abrasion of the interdigital skin. This interdigital injury is secondarily infected by Fusobacterium necrophorum alone, or in combination with Bacteroides melaninogenicus and other organisms which encourage progression to a more severe and necrotic-type of lesion. Failure to institute treatment early in the course of the disease may lead to complications involving the adjacent soft tissues (tendons, tendon sheaths, joint capsules, and bone) ultimately resulting in deep digital sepsis. At this stage, response to medical therapy is quite often unrewarding, thus limiting one's options to either surgery, or possibly euthanasia, in particularly severe cases.

Foot rot is responsive to most antibiotics in common use for cattle. In fact, dose and duration of treatment are likely more important than antibiotic selection. The key to achievement of a successful therapeutic outcome is dependent upon prompt recognition and early implementation of treatment procedures. Systemic antibiotic therapy plus topical treatment of the interdigital lesion have long been the preferred methods of treatment. In uncomplicated cases, improvement is noticeable within 24-48 hours with good recovery attainable in 3-4 days from the onset of treatment. Various antiseptic-type products may be used as topical treatments. Bandaging of the foot is unnecessary.

Foot rot is an important foot problem because it can result in secondary complications. One of the more common of these is infection of the distal interphalangeal joint which leaves very few options: amputation, ankylosis, slaughter in some cases or euthanasia. A more extreme form of the disease has been reported and is termed super foot rot. It’s an extremely severe interdigital lesion and swelling accompanied by lameness that is observed to progress rapidly. Reports suggest that the organisms responsible for this lesion are unusually resistant to common therapy. Fusobacteriums do have the ability to become quite resistant to various types of antibiotic therapies. That can be a problem.

Digital Dermatitis: A Major Problem in Feedlot Cattle

The lesions of DD typically occur on the skin of the plantar aspect of the rear foot adjacent to the interdigital cleft, or at the skin-horn junction of the heel bulbs. On front feet lesions are often found bordering the dorsal (front) interdigital cleft. Most lesions are circular or oval with clearly demarcated borders. Hypertrophied hairs often surround the lesion borders and should be distinguished from epithelial outgrowths that look like long hairs extending from the surface of
chronic lesions. Chronic lesions without these epithelial outgrowths are generally thickened and have a granular surface.

Lesions are very tender and even a mild disturbance of the inflamed tissue tends to result in extreme discomfort and mild to moderate bleeding. Cows will alter their posture and/or gait to avoid direct contact between lesions and the floor or other objects. This is often one of the earliest visual indicators of a DD lesion. These pain avoidance adaptations also lead to abnormal wear of the weight bearing surface of affected claws. As a result, when lesions are on the back side of the foot, animals will walk on their toes and the heel becomes abnormally long. When lesions are on the front of the foot, animals respond by altering posture and weight bearing that result in overgrowth and extension of the toe and greater wear in the heel. So, claw conformation can be a very useful indicator of DD lesions in cattle.

Effects on Performance

Few studies have attempted to assess the effects of DD on performance and those that have were done in dairy cattle. Effects on milk production are generally mild or insignificant. More significant are the effects on reproductive performance where at least one study found an increase of 20 days in the time from previous calving to the next conception in affected cows. To date, there are no reports in the literature on rate impact of DD on rate of gain or other performance parameters of interest to the cattle feeding industry.

Treatment and Control of DD in Feedyard Settings

Numerous studies have demonstrated a response to antibiotic treatment applied topically as a spray. In fact, one of the earliest published reports on treatment of DD lesions was by an Italian veterinarian who described topical treatment in dairy cattle using a product marketed in Italy containing tetracycline and gentian violet. The procedure was to restrain the cow, clean the lesion, spray with the lesion with the tetracycline/gentian violet topical, wait 2-3 minutes, then spray once again and release the cow. He reported a better than 90% cure rate when this procedure was carefully followed. While this might be impractical for treatment in most feedlot settings, it does highlight a few features of this disease that make it a bit unique. Number one, unlike many superficial skin conditions that respond poorly to topical antimicrobial treatment, DD responds very well. In fact, most studies in the literature indicate that topical treatment is more effective than systemic therapy (i.e. by injection of antibiotics). And secondly, the response to topical treatment is quite rapid. Most animals demonstrate remarkable improvement within 24 hours of treatment. On the down side, studies also show that remission of the disease is short-lived and that reoccurrence within 2-3 months is common.

Topical Sprays

Topical antibiotic sprays have been shown to be very effective for treatment of DD. While it can be labor intensive, it offers a couple of advantages over footbath treatment approaches. For one, this treatment method is not affected by freezing temperatures and secondly, DD lesions can be sprayed with full-strength solutions that haven’t been subject to contamination and possible neutralization by organic matter.

At least one Iowa feedlot operator has applied topical spray as a regimen to his treatment strategy for DD. On the advice of his veterinarian, he mixes 16 grams of lincomycin soluble powder in
approximately 2 quarts of water (8 grams/liter) and applies this as a topical spray to the lesions of affected feet. He uses a sprayer which he has loaded into the bed of his 4 wheel farm vehicle. The sprayer holds about 15 gallons of lincomycin solution and is fitted with a 3 foot wand and nozzle designed to deliver 30-40 ml per foot. While this approach to treatment and control may seem complicated to some, this operator argues that spraying is easier than trying to construct and manage a footbath for treatment of cattle in his lots.

**Walk-Through Footbaths**

The use of a walk-through footbath has been a popular approach to treatment of DD in dairy cattle; but there is little information in the scientific literature to support its efficacy. Products or compounds suggested for use usually include CuSO4, ZnSO4, formalin, and various antibiotics. In feedlot conditions one of the first challenges is finding the best location for a footbath so that it can be properly used and maintained. The next issue is design of the footbath; if the footbath is too short animals will jump over it and if it is too narrow animals will step around it.

Previous recommendations on footbath design called for the construction of a 3 foot wide by 6 foot long bath approximately 6 inches deep. Today most advise construction of a footbath 2 foot wide by 12 foot long and 6 inches deep. In addition, the footbaths are constructed with side walls so that cows are unable to place their feet outside of the bath. The primary advantage of the longer bath design is that it requires animals to dunk their feet in the footbath solutions a minimum of 2 times per foot.

**Other Treatment Approaches**

Some recommend systemic treatment with injectable antibiotics. At least one study in dairy cattle did not show a benefit to parenteral therapy. This remains an area for further study to confirm the possible benefits of treatment with some of the newer long-acting antibiotics.

Some have wondered if feed-through antibiotics might be effective. Indeed, there are a few anecdotal reports suggesting efficacy, but as described above these drugs are not labeled for this purpose and pharmaceutical companies that offer these products make no claims that oral treatment is effective. Others have tried surgical removal, burning or cauterizing DD lesions and even cryosurgery (freezing) resulting in little or no benefit. In short, based upon available literature and experience, the best treatments are topical spray or a well-designed and managed footbath.

**Vaccination**

Trials conducted in effort to create a vaccine to treat or prevent DD to date have shown mixed to poor results. In a Nebraska study, dairy heifers given a Treponema bacterin prior to calving had a lower incidence of DD after calving as compared with unvaccinated control animals. On the contrary, in this same study, cows given the bacterin during the dry period had no reduction in lesions as compared with non-vaccinated control animals. Unfavorable results were also observed in similar studies in Germany and the United States using autogenous and/or commercially available bacterins. And finally, researchers recently reported on the results of a study intended to assess the therapeutic value of a *Serpens sp* bacterin in a herd affected with DD. Despite an increase in antibody titers to the *Serpens sp* bacterin following vaccination, there was no effect on the prevalence or percentage of cows lame due to digital dermatitis.
In short, the history of research on digital dermatitis suggests that vaccination is not likely to be an effective therapeutic, control or prevention strategy for the foreseeable future. There is surely much to be learned about digital dermatitis.

**Iowa State University Research on Digital Dermatitis**

The lameness research team at Iowa State University has spent significant time and effort on the study of digital dermatitis using a variety of molecular and observational methods. One study involved monitoring the disease in 61 adult Holstein cows with naturally acquired infections at the Iowa State University dairy over a period of 3 years. Each cow was randomly assigned to a pen within the herd and all cows on the trial were examined on a tilt table every 3-4 weeks during the period of the study. In order to investigate the disease’s natural development and progression, cattle assigned to the trial were diverted around the footbaths and received no DD treatment or control measures during the 3 year period.

The dataset from this investigation consists of information from 900 plus physical examinations, more than 8000 digital photographs, in excess of 1000 biopsies and 350 plus blood samples. To date, we have learned that the classic lesion of DD is usually preceded by one of the following: 1) a non-proliferative dermatitis adjacent to the interdigital cleft that progresses to an advanced state characterized by erosion and a more proliferative lesion, or 2) alternatively, the lesions begin as focal or multi-focal crusts that gradually become more diffuse with varying degrees of acanthosis (thickening of the skin).

![Figure 14. Dr. Adam Krull collects a sample from the interdigital cleft.](image)

![Figure 15. Early stage lesions of digital dermatitis (from Dr. Adam Krull).](image)
Iowa studies suggest that the average time required for lesions to develop from an early to mature stage averages nearly 150 days. Contrary to what some might believe, this suggests that lesions are present well before they cause clinical disease (i.e. lameness). Also of interest is that since we monitored lameness during the 3 year period; we find that our data strongly suggest that all early lesions and a significant percentage of advanced lesions fail to result in significant visual lameness (i.e. a locomotion score greater than 3 on a 5-point scale). We have also utilized modern metagenomic techniques to explore the bacterial diversity of DD lesions and their development. Our data demonstrates that bacterial spirochetes are the most abundant bacteria in mature lesions; but not in early lesions or normal skin. This causes one to question what organisms may be responsible for initiating the disease. Furthermore, the population of spirochetes is not homogenous with over 40 different species associated with lesions at different time points during the period of lesion development. These results beg the question: are spirochetes the organisms responsible for initiating the disease or do they become involved as opportunistic bacterial pathogens?

The Iowa State University studies have also led to important discoveries in the ability to successfully culture (grow the bacteria) spirochetes and also the development of a disease induction model whereby we are able to consistently reproduce the disease (with very characteristic lesions) with an 80-90% rate of success. Studies are currently underway to utilize this model to better understand the etiologic agents associated with disease and the mechanisms of pathogenicity as well as working to develop novel vaccine interventions. Although these findings may seem trivial, they are key steps in the development of effective treatment and control strategies.

References available upon request