

Lameness in Cattle: Rules of Thumb

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Abstract

Lameness remains a major cause of morbidity and economic loss in dairy, cow-calf and feedlot operations. The majority of bovine lameness involves structures of the digit, with digital dermatitis (hairy heel warts), sole ulcers, white line disease, subsolar abscesses and interdigital necrobacillosis (footrot) being among the most common disorders of the digit. Given that owner-initiated diagnosis and treatment appear common in many areas, veterinarians are well positioned to help owners develop protocols for lameness treatment. Application of a few very simple rules of thumb may aid owners in discriminating between cases appropriately managed by farm personnel versus those that warrant prompt veterinary examination. This review will cover guidelines for on-farm diagnosis and treatment of routine lameness cases as well as methods for prompt identification of problematic cases which may require veterinary examination.

Introduction

Lameness remains a major cause of disease and economic loss in dairy, cow-calf and feedlot operations. The impact of lameness on fertility, productivity and farm economics has been extensively reviewed.^{10,12,15,17} The majority (88-92%) of bovine lameness involves the structures of the digit.^{6,11,14,15} Sole ulcer (pododermatitis circumscripta), white line disease, subsolar abscesses and interdigital necrobacillosis (footrot) are common digital disorders that, if not treated promptly, can progress to create infection of bone, synovial structures, tendons and ligaments of the digit.^{1-5,7} These deeper structures may also become infected from solar puncture wounds, lacerations, avulsion injuries of the hoof and proximal progression of subsolar abscesses. Infection of these structures has been termed generalized digital sepsis, or, for the purposes of this discussion, deep sepsis of the digit.

Obviously, it is preferable for medical and/or surgical intervention for lame cattle to occur prior to the establishment of deep sepsis of the digit, simply because treatment options for deep sepsis are more radical and expensive, such as digit amputation or aggressive medical and surgical treatment to salvage the affected digit. Many livestock owners choose to make the initial diag-

nosis of digital disorders, with varying degrees of accuracy, and to initiate treatment on premises. Treatment often consists of antimicrobial therapy, either alone or combined with analgesic therapy, corrective trimming and limited surgical intervention (e.g. paring out of sole abscesses). In a retrospective study of facilitated ankylosis of the bovine distal interphalangeal joint, Desrochers and colleagues found that all 12 cases in their study had received antimicrobial treatment prior to presentation.⁴ The mean duration of lameness prior to surgery for cattle in that study was 5.3 weeks (range, 1-24 weeks).⁴ Pejsa and colleagues found that over 70% of 85 cattle undergoing digit amputation had been treated prior to presentation, with 47% of these animals having a lameness duration of greater than three weeks.¹³ While some treatment failures are inevitable, the results from these studies indicate that some problematic cases of lameness are treated for lengthy periods of time prior to the initiation of aggressive surgical treatment. Another question arises: What went wrong in these cases? Was the diagnosis inaccurate, resulting in ineffective treatment being applied? Was the diagnosis accurate, but the affected animal identified too late in the disease course to head off deep sepsis?

In an effort to reduce the number of such problematic lameness cases, the authors recommend that protocols for diagnosis, treatment and recording of common digital disorders in cattle be established on ranches and dairies. Treatment protocols allow the producer and veterinarian to track the incidence of specific digital disorders, perform periodic, evidence-based reviews of treatment response rates and monitor the dosing and administration procedures for antibiotics and analgesics on the ranch or dairy. Cases that fail to respond to protocol-based treatments can be more readily identified for veterinary examination, thereby facilitating early decisions for treatment or marketing of the animal and potentially limiting application of futile treatments. Improvement in animal welfare, more judicious use of antimicrobials and reduction in treatment costs are additional, potential benefits. Without treatment guidelines, lay personnel may simply attempt therapy with a variety of antimicrobials or topical remedies, often enabling progression of disease through inadequate or inappropriate therapy. As Greenough wrote in 1962, "The established reputation and free availability of biochemicals has made 'home doctoring' popular on the

farm. This practice of hit-or-miss therapy has its successes but all too frequently they end up with a practitioner being presented with an advanced case of generalized foot sepsis".⁹

Protocols for On-Farm Diagnosis and Initial Treatment

Simplicity and clarity are essential to developing treatment protocols for lameness. One of the most critical evaluations that lay personnel can make regarding a lame animal is to address the question: Is the affected foot swollen? Certain disorders of the digit are characterized by digital swelling (e.g. interdigital necrobacillosis, or footrot), and others, if detected early, are not (e.g. pododermatitis circumscripta, or sole ulcers). Thus, determination of the existence of swelling can be the initial step in the layperson's diagnostic process. Since the hoof capsule is rigid and incapable of marked expansion, lay personnel should be instructed to examine the tissues at and immediately proximal to the coronet for evidence of swelling. To facilitate detection of swelling of the foot, lame animals should be moved, if possible, from areas of deep grass or mud onto a packed surface. Heavily soiled feet should be cleaned. Digital swelling can be readily visualized from behind the animal by comparing the distance between the dewclaws of the affected foot to that of unaffected feet. Because the dewclaws are loosely anchored in the soft tissues, they are spread further apart in the swollen foot versus the non-swollen feet (Figure 1). Also, when the affected foot is viewed from the rear, the width of the heel bulbs can be compared to determine if the swelling is more severe in one digit than the other (Figure 1).

Differential Diagnosis of Swollen Feet

Generalized swelling of the digit proximal to the coronary band, involving the pasterns and fetlock and extending proximally for a variable distance, is commonly seen in cases of interdigital necrobacillosis (footrot) and deep sepsis of the digit.¹⁻⁵ In our experience, ranchers and dairy personnel frequently assume that all lame cattle with swollen feet are suffering from footrot; after examination by the herd veterinarian, a variable proportion of these animals have been determined to have deep sepsis of the digit. To enable the layman to differentiate between these two disorders, lay personnel can be instructed to envision an imaginary line that begins in the interdigital space and extends proximally up the foot, bisecting the foot into its two digits along the longitudinal (axial) midline. Because footrot begins in the interdigital skin, the swelling of soft tissues proximal to the coronary band is usually symmetrical relative to the longitudinal (axial) midline

of the foot³ (Figure 2). In contrast to footrot, deep sepsis of a digit usually results in asymmetrical swelling of the foot, with the majority of swelling located on the side of the affected digit; in other words, the affected foot is asymmetrically swollen relative to the longitudinal (axial) midline of the foot (Figure 3). As stated above, the affected foot can also be viewed from the rear, and the width of the heel bulbs compared; deep sepsis of a digit is characterized by appreciable widening of the heel on the affected side. The reason for these findings is simple: The diseased bones, joints and associated soft tissue structures are not located on the axial midline,



Figure 1. The gap between the dewclaws is increased in the right hind foot, indicating the presence of soft tissue swelling. The heel bulb on the lateral digit is wider than the medial digit, suggestive of the presence of deep sepsis in the lateral digit.



Figure 2. Interdigital necrobacillosis (foot rot). Soft tissue swelling is symmetrical relative to the axial midline of the foot.



Figure 3. Deep sepsis of the digit. Soft tissue swelling is asymmetrical relative to the axial midline of the foot.

therefore, the associated soft tissue swelling is greatest over the affected digit. While visible soft tissue swelling may be minimal in cases of septic osteitis of the third phalanx, swelling and erythema of the soft tissues proximal to the coronary band is usually severe in cases of septic arthritis of an interphalangeal joint.⁷ If lay personnel can make this distinction when the affected animal is first examined, cases of deep sepsis of the digit may be identified early in the disease course and veterinary intervention sought promptly.

In cases of deep sepsis of the digit, antimicrobial therapy alone does not usually elicit a cure. It is possible that necrosis of infected tissue and the resultant loss of blood supply prevent effective concentrations of antimicrobials from reaching all areas of bacterial colonization.^{7,16} Thus, digital amputation or digital salvage procedures involving debridement, drainage and lavage of infected structures is usually required for resolution of lameness.^{1-5,7} Amputation of the digit may not be the best treatment option if the animal is heavy, maintained on range, or intended for long-term (> 18-24 months) productivity.^{2,8} If warranted by the affected animal's value, medical and surgical treatment aimed at salvage of the affected digit may be more appropriate, although advanced cases represent a therapeutic challenge to the attending veterinarian.

Causes of lameness that do not typically result in generalized swelling of the foot include uncomplicated cases of digital dermatitis (hairy heel warts), interdigital dermatitis, pododermatitis circumscripta (sole ulcers), laminitis, subsolar abscesses, white line disease and injuries or diseases of the proximal limb. On many large dairies in the authors' region, herd personnel are taught by the attending veterinarian to identify, record and properly treat these conditions. The criteria for each diagnosis should be clearly described and discussed with

herd personnel. The authors have developed treatment protocols to guide detection and direct treatment of these common digital disorders. Because many of the farm and ranch workers in our region are more fluent in the Spanish language than in English, provision of bilingual protocols is necessary. On occasion, producers request flow charts with photos of example lesions to clarify the decision-making process for lay personnel. On some operations, each diagnosis is coded for easy entry into computerized herd health data systems; a code for lameness due to unknown causes is always included in such records systems to facilitate identification of the animal for prompt veterinary examination. In addition, lameness records are regularly reviewed by the herd veterinarian to monitor trends over time in lameness incidence, diagnosis and treatment response rates. Digital cameras facilitate capture of both still and video images of problematic or unique cases for review with the herd veterinarian. We recommend that the herd veterinarian regularly examine acutely lame animals as well as longer-lasting, problematic cases with herd personnel, so that diagnosis and treatment issues can be discussed on a regular basis.

Protocols for Duration of Treatment

Once the herd veterinarian has established clear criteria for on-farm diagnosis of common digital diseases by lay personnel, the preferred treatment and treatment duration for each disorder should be described as well. Particularly for antimicrobial therapy, the duration of treatment should be evidence-based and clearly defined. Cattle that fail to respond as expected within the defined treatment period can then be scheduled for veterinary examination. The veterinarian may then determine if the treatment failure is the result of misdiagnosis or correct diagnosis with therapeutic failure. Remedial worker education and / or alteration of treatment protocols can then be considered. Ultimately, well-defined treatment protocols should reduce the number of animals administered inappropriate antimicrobial drugs for inappropriate periods of time.

Wounds of the Lower Limb

Digital wounds involving puncture of the sole or vertical hoof wall frequently result in infection of the deep structures of the digit. Such wounds usually generate discernable swelling of the soft tissues proximal to the coronary band. Lacerations of the heel and pastern also usually create sufficient cellulitis to cause visible swelling of the foot. In the authors' experience, lacerations and puncture injuries to the distal limb that result in visible lameness are rarely trivial in severity. We (admittedly, empirically) recommend that such ani-

mals be scheduled for prompt veterinary examination, as deep sepsis of the digit is a very common sequel of digital wounds. This protocol for digital wounds could be stated as follows: If a digital wound is severe enough to cause the animal to be lame, the veterinarian should be contacted promptly.

Summary

The rules of thumb that form the basis for our lameness treatment protocols are summarized as follows:

1. Causes of lameness can be categorized according to the likely presence or absence of visible swelling of the soft tissues of the foot.
2. Because interdigital necrobacillosis is centered in the interdigital skin, early cases are characterized by swelling that is symmetrical relative to the longitudinal (axial) midline of the foot.
3. Deep sepsis of the digit is characterized by swelling that is asymmetrical relative to the longitudinal (axial) midline of the foot.
4. On-farm lameness treatment protocols should include an expected deadline for resolution – once the deadline is reached, if the animal has not recovered, the veterinarian should be consulted.
5. Cattle that become lame from digital wounds should be scheduled for prompt veterinary examination.

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