

Lameness in Cattle: Rules of Thumb

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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 well documented. The majority (88-92%) of lameness in cattle involves the structures of the foot; specifically, one or both of the component digits of the bovine foot located below the level of the fetlock (ankle). Sole ulcers, white line disease (defects in the sole at the junction with the vertical hoof walls), and interdigital necrobacillosis (footrot) are the most common foot disorders that create lameness in cattle. If not treated promptly, these relatively superficial conditions can progress to create infection of bone, synovial structures, tendons, and ligaments of the digit. These deeper tissues may also become infected from puncture wounds, lacerations, injuries to the hoof, and progression of sole abscesses. Infection of these deeper tissues has been termed “generalized digital sepsis,” or, for the purposes of this discussion, deep infection of the foot.

Deep infection of the foot is a challenging condition to treat. An example of a severe case is shown in **Figure 1**. While commonly used, amputation of the digit may not be the best treatment option if the animal is heavy, maintained on range or a large dry-lot dairy, intended for natural breeding, or intended for long-term (>18-24 mo.) productivity. Medical and surgical treatments aimed at salvage of the affected digit may be more appropriate in such cases, although these cattle represent a therapeutic challenge to the veterinarian. Obviously, we would prefer to intervene in foot diseases prior to the establishment of deep infection of the foot, because our therapeutic options are limited for this condition. How do we accurately recognize the cause of lameness in cattle? How can we design a treatment program that minimizes the chances of progression to deep infection? Here are some suggestions.

Figure 1. Deep infection of the foot.



On-farm evaluation and treatment of lameness

Most ranchers recognize that most of lameness problems in cattle occur in the foot. One of the most critical evaluations that a rancher can make regarding a lame animal is to address the question: **Is the affected foot swollen?** This is important because the diseases that cause visible swelling in the foot are fairly few in number, but each has its own set of optimal treatments. Because the hooves themselves are rigid and can't swell much, when we speak of a swollen foot, we are typically referring to swelling that is visible above the level of the coronary band – the upper limit of the hoof.

In many cases, the presence of swelling in the foot is obvious on routine observation. However, subtle swelling can be tough to see, and the entire foot can be obscured if the animal is standing in tall grass or deep mud. A fundamental step in observation is to move the animal to solid, bare ground to get a clear look. If routine observation from the front or side does not reveal the presence of swelling, I recommend that the observer move to the rear of the animal. From a rear view, the observer should compare all four feet on the basis of the amount of distance between the dewclaws (stubs of horn on the back of the ankle, shown in **Figure 2** (blue arrow)).

Figure 2. Dewclaws of the foot.



When swelling occurs in a foot, the dewclaws spread apart by the expansion of the skin and subcutaneous tissues. This spread distance can be easily compared to that of the opposite foot. Examples are shown in **Figures 3 and 4**.

Figure 3. Swelling of the left hind foot. Note that the dewclaws on the left hind foot are spread apart farther than the dewclaws on the right hind foot.

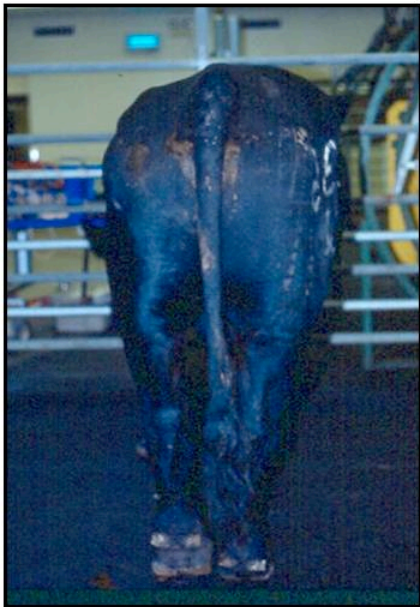


Figure 4. More subtle swelling of the left hind foot.



What causes of lameness typically show swelling of the foot? Swelling of the foot is commonly seen in cases of footrot. Deep infection of the foot results in visible digital swelling as well. Less common causes of a swollen foot include a fracture of the bones of the foot, fescue poisoning, and frostbite. In my experience, ranchers and dairy personnel frequently assume that all swollen feet are cases of footrot. While this is often accurate, there are ways to make sure that a swollen foot is truly footrot.

One way is to pick the foot up and look for the characteristic foul-smelling pus and split, oozing skin in the space between the two digits (commonly called the interdigital cleft or interdigital space). An example of a case of footrot is shown in **Figure 5**.

Figure 5. Footrot. Note the discolored skin in the space between the two hooves – this is termed the interdigital cleft or interdigital space.



Obviously, catching the animal and holding up the foot may not be the easiest or smartest thing to do with a cow or bull on pasture. One can make a diagnosis from a distance, however: Another distinguishing feature of footrot is the orientation of the swelling relative to the long axis of the midline of the foot. A photo of a footrot case is shown in **Figure 6**, with the long midline axis of the foot shown by the dotted line. *Because footrot begins in the skin between the digits, the swelling is usually symmetrical relative to the longitudinal midline axis of the foot.*

Figure 6. Footrot. The long midline axis of the foot is shown as the dotted line. Note that the swelling is *symmetrical* on either side of this line.



In contrast to footrot, *deep infection of the foot usually results in asymmetrical swelling of the distal limb and foot, with the majority of swelling located on the side of the affected digit.* An example is shown in **Figure 7**. Why does the swelling become biased to one side of the foot? Because the deep tissues that get infected – the bones, joints, and ligaments – lie within one of the two component digits of the foot, and the swelling tends to focus around the affected digit.

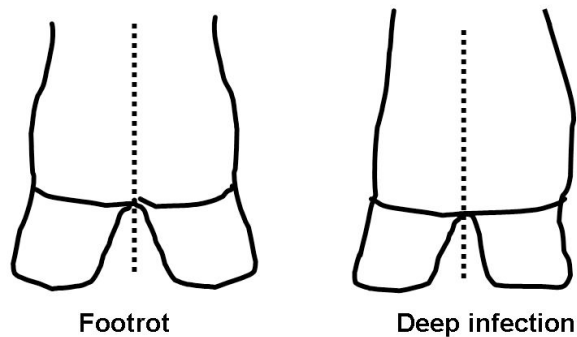
Figure 7. Deep infection of the foot.

Note that the swelling is asymmetrical relative to the long midline axis of this foot.



This concept is summarized in **Figure 8**. If ranchers can make this distinction when the affected animal is first examined, cases of deep sepsis of the digit can be identified early and veterinary consultation can be sought promptly. The pros and cons of treatment, culling, and euthanasia can be discussed, with due consideration to the animal's age and production status, sentimental value, and the severity of the deep infection.

Figure 8. Differentiating footrot from deep infection of the foot.



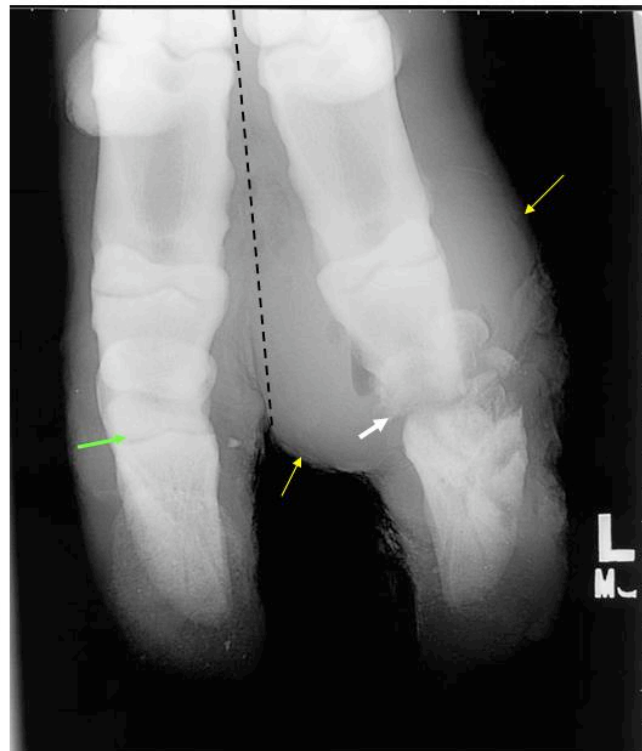
When deep infection occurs, a common anatomic site for infection is the joint that lies closest to the sole of the hoof. This is commonly termed the coffin joint, and it is shown in the x-ray in **Figure 9**. The lining of this joint lies just beneath the skin of the interdigital space, and extension of infection from the interdigital skin (footrot) can occur in a matter of days. Note the destruction of bone around the coffin joint on the affected side. This is very difficult to cure with antibiotics alone.

Figure 9. X-ray of an infection of the coffin joint.

Note the assymetric swelling of the surrounding tissues (yellow arrows) relative to the long axis of the midline (dotted line).

Also note the destruction of bone around the joint (white arrow).

The coffin joint of the unaffected digit is shown with the green arrow.



Cases of lameness that **do not** usually result in swelling of the digit include papillomatous digital dermatitis (hairy warts), interdigital dermatitis, sole ulcers, laminitis, simple subsolar abscesses, or injuries or diseases of the bones and joints of the upper limb. Close examination and palpation of the limb and sole of the foot are required to locate the problem. This often requires a squeeze chute and / or a rotary table that enables one to safely examine the soles of the hooves.

Protocols for on-farm treatment of lameness

In our practice area, owner-initiated treatment of presumed footrot in beef cattle is common and often successful. Treatment regimens vary widely according to personal experience and preferences. It has seemed helpful to ask that ranchers define for themselves and to their ranch hands what, exactly, a successful course of treatment of footrot should look like. Should animals be sound within 3 days? Ten? Here's my definition: Assuming that drug administration technique and dosing are accurate, *cattle with footrot that are treated with an appropriate antibiotic should show resolution of lameness within one week after treatment is started*. Failing this, affected animals should be brought to the attention of the veterinarian, as many of these treatment failures represent misdiagnoses or are footrot cases which have

progressed to deep infection of the foot. By defining what a successful treatment looks like, one can 1) more accurately monitor success rates, 2) seek veterinary advice early in cases of deep infection of the foot, and 3) make informed decisions about changing treatments.

The role of wounds to the lower leg and foot

Digital wounds involving puncture of the sole or the hoof wall may cause infection of deep structures of the digit. Such wounds usually generate deep infection, and therefore can be discerned by the presence of asymmetrical swelling of the foot. Lacerations of the heel, pastern, and lower limb can also create deep infections. Again, an accurate diagnosis by ranch or dairy personnel requires that the foot be washed and examined closely. Owners should also understand that injuries to the distal limb that create visible lameness and/or swelling of the soft tissues are *rarely* trivial in nature. A protocol for foot or leg wounds could be stated as follows: *If a digital wound is severe enough to cause the animal to be lame, the owner should contact the veterinarian.* Cattle aren't wimps, and if the wound makes them lame, it's usually serious and needs attention. Take a look at **Figure 10**. This bull received a small puncture wound to the back of the foot when he kicked back against a wooden fence. The bull was noticed to be lame on the following day, but the wound was dismissed as being trivial because of its small size. This wound had caused infection of the flexor tendon that runs down the back of the leg. Veterinary care was not obtained until roughly a week later, and by then the infection was extensive and severe. The bull recovered after a long stay in the clinic. The duration and expense of treatment would have been far less had the problem been recognized as severe when the lameness first became apparent.

Figure 10. Puncture wound on the back of a bull's foot. The bull became lame 1 day after the injury occurred.



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 footrot (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.