

Foot Rot and Digital Dermatitis (Opportunists in Times of Wet Weather)

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Historic flooding prompted by as much as 15 inches of rainfall and overflowing rivers has brought widespread devastation to northwest and west central Iowa, southwest Minnesota, northeast Nebraska, and the central and southeastern regions of South Dakota. As first responders race to ensure the safety of humans caught in rising flood waters, cattle and dairy producers work to move their cattle to higher ground to escape flooded pastures and lots. Although water levels are gradually receding in some areas, they continue to rise in others. But it's summertime, so next up is heat stress thanks to solar radiation, elevated ambient air temperatures, high humidity, and with soggy wet conditions, "mud," a combination that is difficult for people and potentially deadly for livestock. So, while managing to reduce losses associated with heat stress, it is important to remember that warm, wet, and muddy conditions are also prerequisites for foot rot and digital dermatitis.

Foot rot (FR) is an infectious bacterial disease that is believed to originate in the interdigital skin with rapid involvement of deeper soft tissues of the foot in cattle. Although considered to be caused by a mixture of bacteria, *Fusobacterium necrophorum* is the predominant agent and a natural inhabitant of the gastrointestinal tract of cattle and, therefore, ubiquitous in the cattle environment. Warm, wet weather favors the presence of FR-causing bacteria in the environment while simultaneously softening the interdigital skin. Softened by moisture, the interdigital skin becomes vulnerable to abrasion or injury from stones, twigs, crop stubble, or other extraneous debris. Ever present in the manure and mud, the FR-causing organisms gain access to the deeper tissues of the foot through these interdigital lesions, ultimately resulting in FR (Van Metre, 2017).

Foot rot usually affects rear feet and rarely more than one foot at a time. A presumptive diagnosis of FR is usually based upon visual observation of a generalized, symmetrical swelling that extends upward from the foot to the fetlock joint and occasionally higher. Diagnosis is confirmed by closer inspection of the foot for the presence of a necrotic, foul-smelling lesion in the interdigital skin. In rare cases, skin swelling and redness may occur without an interdigital lesion, a condition called "blind foot rot" or "blind foul".

It is important to know that generalized foot swelling is not a confirmation of FR but rather just one of the earliest observed symptoms. Other conditions that must be considered with foot swelling include injuries or foreign bodies such as a nail or other sharp object penetrating the interdigital skin. **So, the rule of thumb is that when the foot is swollen, always follow up by examining the foot, and particularly the interdigital skin to confirm the diagnosis as FR.**

There is a wide variety of antibiotics labeled for the treatment of foot rot in cattle, including Penicillin, Oxytetracycline, Sulfonamides, Ampicillin, Tetracyclines, Ceftiofurs, Florfenicol, Tulathromycin, Sustain



Figure 1 Interdigital lesion from an acute foot rot. Note the necrotic (dead) tissue associated with the lesion.

III, and Tylan. When treatment is instituted early, penicillin and oxytetracycline are effective. Drugs that provide therapeutic levels for several days are more desirable for convenience. However, some carry extended withdrawal times. Consultation with a veterinarian is advised for making antibiotic selections.

The treatment of FR is not complete without an analgesic for pain. Foot rot is a very painful condition. The labeled options for pain associated with FR are flunixin meglumine (Banamine) by intravenous injection or as a pour-on using Banamine Transdermal (3 ml/100 lb.). A slaughter withhold of 8 days from the last treatment is required. Readers are advised to consult a veterinarian for further advice on pain management options.

Treatment delays risk the possibility of a poorer response to treatment or extension of the infection into nearby joints, tendons, and tendon sheaths. When this occurs, treatment options may be limited to surgery, salvage as a railer, or euthanasia.

Preventative measures are directed at minimizing pen conditions that may predispose to foot and interdigital skin mechanical damage. In the wintertime, frozen or dried mud can cause injury to the interdigital skin and result in outbreaks of FR. If possible, prevent cattle from standing in wet muddy areas by moving them to higher ground or pens without standing water and extremely muddy conditions. Iowa State University Beef Extension Specialist Beth Doran suggests placing whole round bales of cornstalks, straw, or hay in areas with less mud (Doran, 2024). The cattle will tear up the bales and lay on the bedding. Alternatively, if it is impossible to access the feedlot's dirt surfaces, scrape the bunk apron and concrete surfaced areas to provide a dry solid surface for cattle to lie down on. Scrape the apron as needed to keep it dry and clean. Where lots are designed with wide aprons (i.e., over 20 feet), bedding can be applied to form a bedded pack for use until conditions improve. Whenever the lot terrain has low areas where water collects, cattle will develop wallows in hot weather. During drier times, focus on grooming pens, filling low areas, and ensuring good drainage of lots. Some recommend building mounds to enhance drainage, giving cattle a drier place to lie down.

The value of footbaths for control of foot rot is unknown; however, in desperation, some have resorted to footbaths to deal with what seems like an outbreak or just an unusually high number of FR cases. If a footbath is likely to have any benefit, it will require clean pen conditions (and clean feet) and frequent re-changing of the bath with new solutions.

Fusogard™ is a bacterin (a suspension of killed bacteria) licensed for use as a vaccine to control liver abscesses and FR. The general consensus is that foot rot vaccines can help reduce the incidence of foot rot in cattle, but they don't eliminate the disease. In studies where the vaccine did not affect the overall incidence of disease, it was believed to have reduced the severity of symptoms in animals affected FR.

Digital dermatitis (DD) was first described 50 years ago by a pair of Italian veterinarians, Dr. Carlo Mortellaro and his colleague Dr. Cheli in 1974. Oddly enough, there were two reports in that same year by veterinarians from the United States; one describing papillomas on the feet of an Angus bull and a second report of atypical warts in a herd of polled Hereford cattle. Today, the disease is worldwide in occurrence, and despite 50 years of research, there is no vaccine and no treatments that provide a lasting cure.

Typical lesions of DD are found on the rear feet in or around the plantar interdigital cleft between the heel bulbs and in the interdigital space on the interdigital skin. Lesions on the front feet typically occur around the interdigital cleft on the dorsal or front side of the foot. Early lesions are easily missed; they don't cause lameness and they are not particularly sensitive. They appear as very subtle lesions on the interdigital cleft's skin folds (Figures 3 & 4). Mature lesions have an ulcerative to mildly granular surface and are normally quite sensitive to touch. Hypertrophied hairs are often observed at the margins of the lesions. Chronic lesions are thickened with a granular surface with epithelial outgrowths that appear as hairs growing from the surface of the lesion (thus the name hairy heel wart) (Figure 2).

The constant exposure of feet to manure slurry softens the skin making it more susceptible to abrasion and infection. There is no consensus on what organisms initiate the disease, but Iowa State University (ISU) research suggests it to be a mixed group of organisms. Later in the course of the disease, the predominant organisms in lesions are *Treponema sp.* Research at ISU determined that the progression of a lesion from normal skin to a mature chronic lesion takes, on average, about 133 days (Krull et al., 2014; Krull et al., 2016).

Efforts to find a treatment have included topical sprays, direct application of antibiotics, and footbaths using multiple disinfectants. Topical sprays were effective during treatment, but lesions became active and painful after a few weeks of no treatment. This procedure also proved to be labor-intensive. Similar results were observed with a one-time topical treatment with tetracycline powder. In a study of 43 cows with mature and chronic type lesions, four (9%) returned to normal skin and did not reoccur (Krull et al., 2016; Plummer and Krull, 2017). A study to evaluate retreatment 2-3 times yielded similar results. And finally, results using a 3% formalin footbath found control of immature lesions, but little to no effect on mature and chronic lesions. The results of these studies mirror that observed in feedlots and dairy farms that treatment, whether by topical spray, direct application of antimicrobials, or in a footbath, provides only temporary relief, and most lesions reoccur after several weeks.



Figure 2. Typical location of a digital dermatitis lesion at the interdigital cleft (between the heel bulbs). The lesion is thick, indicating it is chronic lesion.



Figure 3. Photo showing a DD lesion (within the white circle) at the earliest stage. Note the eroded skin on the edges of the interdigital cleft.

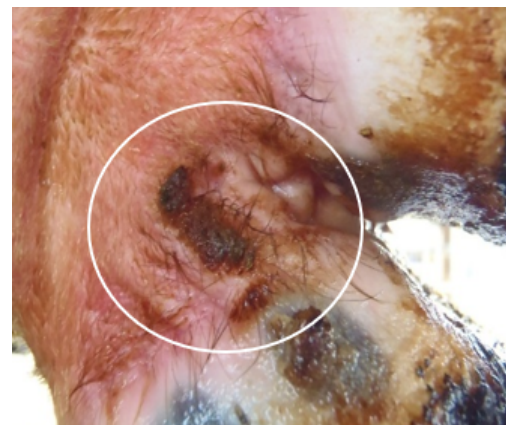


Figure 4. An early DD lesion (within the white circle) slightly more mature than the earliest lesion. The lesion is the dark area affecting only one side of the interdigital cleft extending to the heel.

The good news is that by treating early lesions (those that most never see) over time with proper environmental management and use of a footbath, one would expect to see a lower overall prevalence of the mature and chronic lesions that do not respond well to treatment. Secondly, DD lesions are very painful. Therefore, it is important for welfare reasons, to treat mature and chronic lesions that may be causing pain and reducing performance. Research at ISU indicates that topical copper sulfate is likely the best option for direct application treatment (Coatney, unpublished data).

Economic Impact

Previous studies indicate that lameness accounts for approximately 30% of all treatments in feedlots with lame cattle weighing 48 lb less than healthy pen mates. Based on cattle prices and values used in the calculation, this equated to \$60 on a 1400 lb steer, not counting losses from treatment, railing, salvage slaughter, or euthanasia (Erickson et al., 2022). In a Canadian study where the cost to finish a healthy animal was \$710/animal, the cost of finishing an animal with FR was \$861 (a difference of \$151). Railed cattle had a net loss of \$700 (Davis-Unger et al., 2017). Researchers reported significantly lower average daily gains and finished carcass weights in cattle affected with DD compared to unaffected cattle (Cortes et al., 2021; Kulow et al., 2017). Economic analyses found DD second to bovine respiratory disease as the most impactful disease (Cortes et al., 2021).

In conclusion, the recent weather extremes have brought about very challenging times. While we place the care of family, friends, and neighbors as our highest priority, we mustn't forget the critters that are the reason why we do what we do nor the diseases that seemingly "lie in wait" for an ***opportunity*** to cause disease; two of the worst are foot rot and digital dermatitis. Be aware of these diseases, find them early, and treat them promptly.

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