# Foot Rot in Cattle

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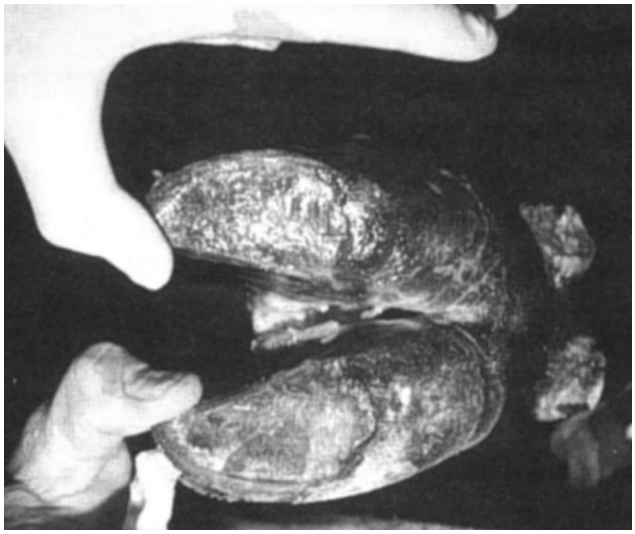

**Figure 1. Foot rot in a cow showing separation of the interdigital skin, revealing a whitish-yellow necrotic core-like material.**

Foot rot is a sub-acute or acute necrotic (decaying) infectious disease of cattle, causing swelling and lameness in at least one foot. This disease can cause severe lameness and decreased weight gain or milk production. Lame bulls will be reluctant to breed, and severely affected animals may need to be culled from the herd. The disease can become chronic, and if treatment is delayed the recovery prognosis is poor. This results in deeper structures of the foot becoming affected. Weight gain is significantly reduced when grazing cattle contract the disease. One three-year study reported that affected steers gained 2.3 lbs. per day, while steers not affected gained 2.76 lbs. per day (Brazzle. 1993). The incidence of foot rot varies according to the weather, season of the year, grazing periods and housing system. Foot rot is usually random in occurrence, but the disease incidence may increase up to 25 percent in high-intensity beef or dairy production units. Approximately 20 percent of all diagnosed lameness in cattle is actually foot rot.

## Cause

Normal healthy skin will not allow the bacteria involved in foot rot to enter the deeper tissues. Mechanical injury or softening and thinning of the interdigital (between the toes) skin by puncture wounds or continuous exposure to wet conditions are necessary to provide entrance points for infectious agents. Grazing stubble on recently mowed pasture may irritate the interdigital skin as well as standing in environments heavily contaminated with feces and urine. Injury is often caused by walking on abrasive or rough surfaces, stony ground, sharp gravel, hardened mud or standing in a wet and muddy environment for prolonged periods of time. High temperatures and humidity will also cause the skin to chap and crack, leaving it susceptible to bacterial invasion. *Fusobacterium necrophorum* is the bacterium most often isolated from infected feet. This organism is present on healthy skin, but it needs injury or wet skin to enter the deeper tissue. *F. necrophorum* appears to act cooperatively with other bacteria, such as *Porphyromonas levii, Staphylococcus aureus, Escherichia coli*, and *Actinomyces pyogenes*, thereby decreasing the infective dose of *F. necrophorum* necessary to cause disease. *Prevotella intermedia* has also been implicated as causative agent for foot rot.

*Porphyromonas levii* (formerly Bacteroides nodosus), the organism causing foot rot in sheep, may cause an interdigital skin surface infection in cattle, allowing entrance of *F. necrophorum*, thereby causing foot rot. Mineral deficiencies of zinc, selenium and copper seem to increase the incidence of disease.

## Transmission

Feet infected with *F. necrophorum* serve as the source of infection for other cattle by contaminating the environment. *F. necrophorum* can be isolated on non diseased feet, as well

as in the rumen and feces of normal cattle. *Porphyromonas levii* and *Prevotella intermedia* can also be isolated from the alimentary system of cattle. Since these organisms are part of the normal gut flora, they are readily available to contaminate the environment. Once loss of skin integrity occurs, bacteria gain entrance into subcutaneous tissues and begin rapid multiplication and production of toxins, further stimulating continued bacterial multiplication and penetration of infection into the deeper structures of the foot.

## Clinical signs

Foot rot occurs in all ages of cattle, with increased incidences during wet, humid conditions. When case incidence increases in hot and dry conditions, attention must be directed to loafing areas, which are often crowded and extremely wet from urine and feces deposited in small shaded areas. The first signs of foot rot include:

- Extreme pain leading to sudden onset of lameness, which increases in severity as the disease progresses.
- Acute swelling and redness of interdigital tissues and adjacent coronary band.
- Lesions in the interdigital space are often necrotic along its edges and have a characteristic foul odor.
- Evenly distributed swelling around both digits and the hairline of the hoof, leading to separation of the claws.
- Fever.
- Loss of appetite.

These lesions are sometimes difficult to see unless the foot is picked up. It can affect both the front and hind limbs. It initially affects a single foot on most occasions. Eventually, the interdigital skin cracks open, revealing a foul-smelling, necrotic, core-like material (Figure 1). If untreated, the swelling may progress up the foot to the fetlock or higher. More importantly, the swelling may invade the deeper structures of the foot such as the navicular bone, coffin joint, coffin bone and tendons. “Super foot rot,” seen in some areas of the country, has received this name due to the rapid progression of symptoms, severity of tissue damage, and lack of response to standard treatments. The standard footbaths have not been effective in preventing the "super foot rot" form of the disease. Veterinary supervision and earlier therapy resulted in a more satisfactory outcome.

## Diagnosis

Diagnosis of foot rot can be made by a thorough examination of the foot, looking at the characteristic signs of sudden onset of lameness (usually in one limb), elevated body temperature, interdigital swelling and separation of the interdigital skin. Other foot conditions causing lameness that may be confused with foot rot are: interdigital dermatitis, sole ulcers, sole abscesses, sole abrasions, infected corns, fractures, septic arthritis and inflammation or infection of tendons and tendon sheaths, all of which often involve one claw of the foot only. Swelling attributable to foot rot involves both claws.

Digital dermatitis (hairy heel warts) is often confused with foot rot because of foot swelling and severity of lameness. Digital dermatitis affects only the skin, beginning in the area of the heel bulbs and progressing up to the area of the dew-claws; whereas, foot rot lesions occur in the interdigital area and invade the subcutaneous tissues. Cattle grazing endophyte infected fescue pastures and develop fescue toxicity. This causes loss of blood circulation to the feet and subsequent lameness, sometimes mistaken as having foot rot.

## Treatment

Treatment of foot rot is usually successful, especially when instituted early in the disease course. Treatment should always begin with cleaning and examining the foot to establish that lameness is actually due to foot rot. A topical treatment of choice should be applied at that time. Some very mild cases will respond to topical therapy only. Most cases require the use of systemic antimicrobial therapy. A local veterinarian may advise on recommended antibiotics and dosages for each situation.

Use of a non-steroidal anti inflammatory may be indicted for pain relief.

Affected animals should be kept in dry areas until healed, if possible. If improvement is not evident within three days to four days, it may mean the infection has invaded the deeper tissues. Infections not responding to initial treatments need to be re-evaluated by a veterinarian in a timely manner. A local veterinarian will want to determine if re-cleaning, removing all infected tissue, application of a topical antimicrobial and bandaging are appropriate, along with a change in the antimicrobial regimen. In the more severe cases, management of the animal will be between salvaging for slaughter (following drug withdrawal times), claw amputation, or in valuable animals, claw-salvaging surgical procedures. A veterinarian will be able to provide information needed in making this decision.

## Prevention

Preventive and control of foot rot begins with management of the environment. Prevention of mechanical damage to the foot caused by frozen or dried mud, brush-hogged weeds or brush stubble and gravel is desired. Attempt to minimize the time cattle must spend standing in wet areas. Pens should be scraped and groomed. Areas around ponds, feed bunks and water tanks should be managed to reduce mud and manure. Other preventive measures presently used include footbaths (most often used in confinement beef or dairy operations), addition of organic and in-organic zinc to the feed or mineral mixes and vaccination.

Low-level feeding of chlortetracycline (CTC) is labeled through the Food and Drug Administration for beef cattle for the reduction of liver abscesses at 70 mg per head per day. *F. necrophorum* is the major infective agent in liver abscesses and foot rot in cattle. CTC is labeled at 350 mg per head per day (at least 0.5 mg per lb per day) in beef cattle less than 700 lbs, and 0.5 mg per lb per day in cattle more than 700 lbs, for the prevention of anaplasmosis. Consequently, many mineral mixes and commercial supplements are formulated to provide 350 mg per head per day, to control those diseases listed on the CTC label. Since foot rot is caused by the same organism as liver abscesses, some control of foot rot should occur at the 350 mg per head per day level. Controlled comparative studies evaluating the effectiveness of continually feeding CTC to grazing stocker cattle have not been reported. Most research trials indicate that average daily gain is increased

in grazing cattle by 0.1 lb to 0.3 lb when CTC is included in a free choice mineral mix in grazing cattle. There is no label use for CTC in lactating dairy cattle due to milk residue problems.

When cattle are moderately to severely deficient in dietary zinc, supplemental zinc may reduce the incidence of foot rot. Zinc is important in maintaining skin and hoof integrity; therefore, adequate dietary zinc should be provided to help minimize foot rot and other types of lameness. A three-year study has shown zinc methionine added to a free-choice mineral supplement reduced the incidence of foot rot and improved daily weight gain in steers grazing early summer pasture (Table 1).

**Table 1. The effect of zinc methionine in a mineral mixture on gain and incidence of foot rot on steers grazing native pastures[a].**

| *Ingredient* | *Zinc Methionine* | *Control* |
|---|---|---|
| Number of steers | 342 | 354 |
| Starting wt., lbs. | 583 | 587 |
| Daily gain, 93 days, lbs. | 2.79[a] | 2.71b |
| Incidence of foot rot, % | 2.45 | 5.38b |
| Daily mineral intake, lbs. | .24 | .22 |
| Daily zinc methionine intake, g. | 5.4 | - |

a Brazle, F.K. 1993. Cattlemen's Day Report of Progress 704. Agriculture Experiment Station. Kansas State University.

Supplemental iodine has been shown to prevent naturally occurring foot rot in beef cattle (Maas, 1984). Iodine can be supplemented in trace mineral formulations in total mixed rations, salt-mineral mixes for grazing animals, molasses based formulations and other methods. Common supplements include sodium iodide, calcium iodate and EDDI (ethylene-diamine dihydriodide; organic iodide)

A commercial vaccine approved for use in cattle as a control for foot rot is available. Reported results by producers and veterinarians have been mixed from their use of this product, and controlled studies have not been reported. A local veterinarian, by knowing a specific geographic area, will be able to assist in initiating preventive measures for foot rot.

## Summary

Foot rot is a major cause of lameness in cattle and can have a severe economic effect on the farm. For treatment to be effective, it must be started early in the course of the disease. It is necessary to have a break in skin integrity for foot rot to occur. The most important preventive measures are centered on the protection of interdigital skin health.

### References

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