

FOOT ROT IN CATTLE

by Pat White, DVM

There are many things that can cause lameness in cattle. One of the most common is the condition called interdigital necrobacillosis or foot rot. (It is also known as foul, foul in the foot, infectious pododermatitis and interdigital phlegmon.)

Foot rot in cattle is caused by *Fusobacterium necrophorum*, which may act alone, or in concert with a few other bacteria, including *Bacteroides melaninogenicus*, *Staphylococcus aureus*, *Escherichia Coli*, *Actinomyces pyogenes* and the newly blamed *Porphyromonas levii*. *Dichelobacter (Bacteroides) nodosus*, the causative agent of the highly contagious foot rot seen in sheep, can cause a superficial surface inflammation in cattle, allowing the entrance of the pathologic *F. necrophorum*.

F. necrophorum is a normal commensal bacteria found in the intestines of healthy cattle, and generally does not penetrate dry, healthy skin. In addition to foot rot, it is the cause of necrotic stomatitis in calves, calf diphtheria and is isolated from liver abscesses in feeder cattle. It acts synergistically with other bacteria, such as the ones listed above, which decrease the dose of *F. necrophorum* necessary to cause illness. In the case of foot rot, diseased or injured skin is susceptible to infection, so anything that damages the interdigital area can predispose to it. High rainfall, wet, muddy feedlots, or even just standing in that puddle of urine cattle are so good at making and standing in to apparently cool their feet, can cause maceration of skin tissue and allow penetration of the causative organism. High temperatures and humidity may cause chapping and cracking of the skin, leaving it vulnerable to bacterial invasion. Injury caused by sharp pieces of stone, wood, thorns, frozen manure and even corn or alfalfa stubble can precipitate a case of foot rot. Once loss of skin integrity occurs, the bacteria gains entrance into the subcutaneous tissues and begins to rapidly multiply. With multiplication comes the production of toxins that further proliferate the infection and cause necrosis (death) or decay of the infected tissues. There exist conflicting reports on susceptibility due to age; some references claim the condition is usually seen in older cattle, others claim calves are more susceptible to infection. Based on my own experience, I would guess that sporadic cases are more likely in "older" cattle (weaning on up) but in cases of outbreaks and severe environmental contamination, calves may very well make up most of an outbreak. Regardless of age, acquired immunity appears to be poor.

Unlike foot rot in sheep, the disease in cattle is usually sporadic and while very infectious, it is not generally considered highly contagious but it may affect larger numbers of cattle in outbreaks situations or in certain problem herds. Certainly, infected feet serve as a primary source of infection for other cattle by contaminating the environment with high levels of the organism but predisposing factors must be present to cause disease. The bacteria have been estimated to live between 1 and 10 months outside the body, depending on conditions so that high environmental levels may be present for an extended period of time. If a cluster of cases is seen during hot dry weather, then particular attention should be paid to the primary loafing area, often in a shady part of the pasture, where crowding of animals results in urine and manure ponds. Sometimes extremely wet weather can lead to a few cases, with more showing up later when everything appears dry. This is probably due to previous heavy contamination of these isolated wet loafing areas and trauma to the interdigital skin produced by dry stubble or sharp stones.

The first sign of foot rot is acute swelling of the tissue between the toes and swelling evenly distributed around the hairline of usually just one hoof. Often, the animal may be running a fever at this time. Acute foot rot appears to be exquisitely painful, the cattle are often dead lame on one foot, with reluctance to move, and increased recumbency. Calves are usually easy to diagnose from a distance, as their lighter body weight allows them to move about relatively well on three legs, rather than remaining recumbent. Also, their smaller, more delicate features may allow easier detection of the tell-tale swollen foot. Eventually, the interdigital skin cracks open, revealing a necrotic, vile-smelling core of dead tissue. Untreated, the infection may cause swelling to extend up the foot to the fetlock or higher. More critical, severe cases may invade the deeper structures of the foot, including the bones, tendons and joints, resulting in permanent damage.

Other conditions that may resemble foot rot include interdigital dermatitis, sole abscesses, sole abrasions, infected corns, fractures, joint infections (septic arthritis) and tendonitis. These conditions usually involve only a single claw of a single foot and not the areas of skin between the toes. Digital dermatitis (hairy heel warts) usually occurs on the back of the foot, just above the bulb of the heels and may progress up to the dewclaws. Large hairy heel warts are unmistakable in the peculiar, large horny "hairs" that

grow from the chronically inflamed skin. They require only topical therapy, while foot rot, unless caught very early and a very mild case, requires systemic antibiotics.

Certainly many cases of foot rot heal on their own within 7-10 days, however, due to the tendency to progress animals must be watched very closely to determine if in fact, healing is occurring and whether systemic treatment should be given. In range animals not under close observation, sustained duration of action is a must in any antibiotic chosen.

Treatment is usually straightforward once the diagnosis has been confirmed. Probably length of treatment time is more critical than which antibiotic is used. A minimum of 3-5 days of antibiotic therapy will be necessary and in severe or resistant cases, longer than that. A number of injectable antibiotics are usually highly effective against the foot rot organism. Treatment should always begin with cleaning and examination of the foot. If extremely mild and early, topical treatment with antibiotic ointment or soaks may suffice; however, close observation must continue to make sure the infection is responding to the treatment. Sometimes "flossing" between the toes with a clean rope or twine will help to remove some of the dead tissue. Injectable antibiotics are the mainstay of treatment for foot rot. They need to be used at a high enough dose for a long enough period of time to cure the infection. This will require adequate blood levels for a minimum of 3-5 days and at least several days past apparent cure (the animal is sound, not limping, without swelling and without fever).

Deep infection of the foot may occur as a result of untreated or severe cases of foot rot. Involvement of the joints, tendons or bones of the foot will not be correctable with foot trimming procedures and often will result in permanent lameness ultimately requiring slaughter. Unfortunately, the dorsal pouch of the distal interphalangeal joint is very close to the interdigital skin and can become infected due to foot rot. The disease is not to be taken lightly.

Affected animals should be kept in dry areas until healed. This accomplishes 2 things; speeds healing in the infected animals and limits environment contamination. Foot rot that progresses to a severe infection may require salvaging for slaughter (carefully following drug withdrawal requirements), claw amputation or in extremely valuable animals, claw salvaging surgical procedures.

Prevention of foot rot is of course, preferable to treatment. Effective preventative measures include minimizing the time cattle can stand in wet contaminated areas, as well as minimizing exposure to clipped weeds, pasture or brush that has stubble high enough to injure the interdigital skin. Footbaths are impractical for most beef operations, although may be possible for small herds. Other preventative measures include the addition of zinc and/or organic iodine to the feed or mineral mixes and vaccination. If cattle are moderately to severely deficient in zinc in the diet, supplemental zinc may reduce the incidence of foot rot. One study supported the use of 5.4 gms per day of zinc methionine in grazing steers. Historically, organic iodide (EDDI) has been added to salt mixes to aid in the prevention of foot rot. Vaccination with a killed *F. necroforum* bacterin (Fusoguard-Novartis) may reduce clinical signs of infection and should be considered if other control methods fail or a severe outbreak is anticipated. It requires an initial vaccination with a booster dose given 3 weeks later. Based on references citing the lack of good acquired immunity to natural disease, I do have to wonder about the efficacy of vaccination. While feed antibiotics would be convenient to treat foot rot, there are no feed-grade antibiotics approved for foot rot treatment in the USA. Extralabel use of feed additives is prohibited and against the law in the United States.

Sources of injury should be removed from pastures and feedlots. Mud holes should be filled and stagnant pools drained or fenced off. Manure should be removed frequently in confinement operations. Lanes and walkways should be kept well-graded and drained, avoiding low areas. Regular foot trimming will keep animals walking comfortably and prevent injury due to abnormal locomotion.

Over-the-counter antibiotics labeled for foot rot include LA 200 and Biomyacin, both containing oxytetracycline, Sustain III (sustained release sulfa boluses) and Tylan. All can be excellent treatment for foot rot if used at appropriate dosages. I have personally used Biomyacin with excellent results at label dosages.

In addition to the above listed antibiotics, there are a number of excellent prescription antibiotics that effectively treat foot rot. Advantages of these prescription antibiotics include low volumes and/or extended duration of therapy. Generally cost of the drug will not be an advantage, as these products are usually more expensive than OTC meds but if consideration is given to labor time and costs, they become extremely attractive options.

Any of the ceftiofur preparations are labeled and excellent for foot rot. Naxcel is a non-irritating, low volume and short withdrawal period form, that must be rehydrated prior to use and given one time per day. Excenel is the same antibiotic (ceftiofur) in a ready to use formulation that may be administered every 1-2 days, at relatively low volume. Excede is a sustained release formula of Cefotiofur that maintains blood levels for up to 7 days; however, it can only be administered ***subcutaneously in the ear***.

Micotil is another excellent antibiotic that is low volume with 7-10 day duration of activity. (label says 3 days but antibiotic is present in white blood cells for an extended period of time). However, I do not use Micotil as it is highly toxic if accidentally injected into yourself or another human. There have been at least 13 deaths associated with human exposure to Micotil since 1995, some accidental and some apparent suicides.

Nuflor is another good antibiotic but a very thick solution that makes loading a syringe difficult and requires relatively large volumes for a duration of 4 days.

Tetradure is an oxytetracycline antibiotic that has a 7 day duration of therapy, is relatively inexpensive but is also very thick and difficult to syringe and requires large volumes for the average cow (60-80 cc) which must be given in multiple sites as no more than 10 cc should be given in one location. I use Tetradure quite a bit and like it despite its drawbacks.

The last prescription antibiotic I will mention is relatively new called Draxxin. It is in the same antibiotic class as Micotil but doesn't come with the same extreme human toxicity. It is very low volume, easy to syringe, with a 7-14 day duration of activity. It is extremely expensive but very effective. I like Draxxin very much despite its expense.

One remark on the use of Procaine penicillin G; (Pen-G, Agricillin, Crysticillin, Pen-Aqueous) Pen-G is a wonderful antibiotic when used for the right type of infections and at appropriate dosages. Foot rot falls into the right type of infection but the dosage listed on the label is, in my opinion, totally worthless. I would not give an injection of penicillin G at the labeled dosage for any reason in cattle. However, Pen-G is a very popular OTC antibiotic that everybody seems to keep in their barn or tack box. LA 200, Biomyacin or sulfa boluses are all excellent antibiotics and much better choices at label dosages for OTC uses in cattle.

Foot rot is a serious infection but with early intervention and vigorous treatment, most cases will have a favorable outcome.