# Musculoskeletal Disorders - Cattle

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## Introduction

This section covers a wide range of musculoskeletal conditions. The most important are the management related conditions of dairy cattle which result in reduced quality of hoof horn, excessive wear on the hoof or infectious disease as a result of poor hygiene.

## Class Objectives:

1. Distinguish the types of conditions which may affect the musculoskeletal system of cattle.
2. Relate the factors which may predispose to lameness in cattle to the conditions which affect the animals.
3. Outline and describe the common diseases that affect the hoof of cattle.
4. Explain the lameness scoring system used in cattle lameness evaluation.
5. Recommend management factors to help limit the incidence and severity of lameness in cattle.
6. Explain and contrast the types of therapy used in combating lameness in cattle
7. Compare and contrast the types of septic arthritis that may affect cattle
8. Compare the conditions that are associated with upper leg lameness in cattle.
9. Identify the common etiologies of muscle problems that affect cattle.

**Lameness in cattle**
95% of lame cattle are dairy breeds
80% of cases involve the digits
80% of digital lameness involves the hindlimbs
50% of digital lameness involves the horn and 50% the skin (mostly heel warts)
70% 0f the horny lesions involve the outer claw

## Management Related Disorders of the Bovine Foot

### Diseases of the hoof horn

Laminitis – inflammation of the laminar corium, founder
Sole hemorrhage
Sole ulceration

Under-run sole
White line disease – separation of the laminar corium
Heel erosion – slurry foot
These management related hoof disorders are all part of the same syndrome, and in fact may all be seen together in the feet of a single cow. The management failures that lead to these conditions may be complex, but they lead to poor quality of the hoof horn, stress on the foot, and excessive or uneven wear of the sole of the foot. Feeding problems are implicated, particularly sub-acute rumen acidosis (SARA). Other important factors relate to hoof wear on concrete, poor cow comfort in the stalls, leading to reduced lying times and increased mechanical stress on the foot.

**It is essential that you read the article by Christer Bergsten which discusses these issues. You are responsible for the information in the article.**

Laminitis: Causes, Risk Factors and Prevention – Christer Bergsten

The article by Lischer and Ossent describes the pathophysiology of sole lesions.

Pathogenesis of Sole Lesions Attributed to Laminitis in Dairy Cattle - Lischer & Ossent

Blowey's article describes lameness management on a herd basis.

Factors Associated with Lameness in Dairy Cattle, Roger Blowey, *In Practice* (2005) **27**, 154-162

## Infectious Disorders

### Infectious pododermatitis (foot rot, foul in the foot)

Infection of the interdigital skin that extends into the soft tissues of the foot causing swelling, pain and lameness, often severe. Fever and general malaise are common. On examination of the foot a foul smelling necrotic fissure is found in the skin between the clawas. Distinguish from digital dermatitis (hairy heel warts) which affects the skin in the area of the heel bulbs rather than the interdigital space. Footrot develops after injury to the interdigital skin is infected by *Fusobacterium necrophorum*, with or without co-infection with *Bacteroides sp.*.

#### *Complications*

Septic arthritis of the distal interphalangeal joint, and occasionally the sesamoid bursa and tendon sheaths. These complications may make claw amputation or slaughter necessary.

#### *Treatment*

Early systemic antibiotic treatment is effective. Ceftiofur is commonly used in dairy cattle (no milk withholding) but sulfadimethoxine, procaine penicillin G and oxytetracycline are also effective. The longer treatment is delayed the poorer the prognosis.

## Digital dermatitis (papillary digital dermatitis, hairy heel warts)

This condition affects most confinement dairies. The only ones that seem to have escaped it are those that never buy cows or bulls.

Lesions typically appear most commonly at the bulb of the heel, but may also be seen at the front of the interdigital cleft (84% plantar/palmar, 13 % dorsal -. J Vet Diagn Invest 10:67–76 (1998)). Over 80% of lesions are in the hind foot. The term "hairy heel warts" derives from the appearance of hair-like papillary projections of hyperkeratotic skin. Epidemiologic observations indicate that the condition behaves as an infectious disease, as suggested by geographic spread, evidence of contagion, high prevalence in young cows, and high within-herd morbidity. Intralesional invasive spirochete organisms resembling *Treponema* spp. are seen.

Poor hygiene and flush systems for removing manure from cow barn alleyways have been suggested as a contributing to the spread of infection within a herd. However many well managed herds battle heel warts on a daily basis.

There is no currently marketed vaccine (Trep Shield from Novartis and Hygeia's *Serpens spp.* were both withdrawn).

### *Treatment and control*

Persistence in treatment and control methods is the key to management. It is almost impossible to eradicate this condition from a herd. It is only possible to manage it through consistent and persistent application of control methods.

Practical options are individual cow treatment (foot wrapping),use of footbaths or spraying lesions with a garden sprayer.

***Individual treatment***. Lesions respond to antibiotic sprays and antibiotic application under a hoof bandage. Recurrent or new lesions develop within 7-12 weeks of successful treatment in 50% of cows.

**Topical spraying**

| | Concentration | Amount/gallon |
|---|---|---|
| Oxytetracycline and tetracycline e.g. Terramycin-343 powder | 25 mg/ ml | 100 gms/gal (one 4.78 ounce of terramycin-343 soluble powder/gal) |
| Lincomycin | 8mg/ml | 32 gms/gallon (two 1.41 oz packets of Lincomix/gal) |
| Lincomycin/Spectinomycin | 0.5-1.0 mg/ml | 2 to 4 gms/gal<br>1 package LS 50/20 gallons water<br>Or 1 package LS 100/40 gallons |

Add ¼ cup laundry detergent to 2.5 gallon sprayer. Be careful not to spray udder or milking equipment

## *Footbath management for heel warts and classical foot rot.*

Bath needs to be 6" deep so that it submerges the interdigital skin and reaches lesions close to the dew claws. Most common are walk-through baths in the exit alley from the milking parlor. Contamination is the main limiter of footbath effectiveness. Manure rapidly inactivates active ingredients so a pre-bath is often used to attempt reduce contamination of the footbath.

Footbath capacity in gallons = length (feet) X Width (feet) X height (feet) X 7.46

A 60 gallon footbath containing antibiotic or copper sulfate loses half its effective activity after only 50 cows. On the other hand formalin stands up well to contamination and retains its effectiveness longer (but is dangerous for workers). Footbaths may need to be used 3 or more times a week to give effective control of heel warts. Treatment programs require persistence over long periods, or even indefinitely, to be successful. Do not exceed recommended levels of formalin or copper – damage to feet can occur. Addition of 1 cup detergent/10 gal water helps medication adhere to the tissues of the foot.

**Footbath Medication**

| | Concentration | Mixing |
|---|---|---|
| Formalin 37% | 3% *(Do not exceed 5%)* | 1:20 (1 gal/20 gal water) |
| Copper Sulfate | 5-10% | 8-16lbs/20 gallons water |
| Formalin/Copper sulfate | 3% formalin/2% copper sulfate | 1 gall formalin + 4 lbs Copper sulfate/ 20 gallons water |
| Oxytetracycline/Tetracycline Eg Terramycin-343 powder | 0.1% | 51 gms antibiotic/15 gal water |
| Lincomycin (Lincomix) | 0.01% | One 40 gm packet (16 gms Lincomycin) per 45 gallons water |
| Lincomycin/Spectinomycin | 0.01% | One package (150 gms)/5 gal water |

Antibiotic use in footbaths and sprays is extra-label use

## Septic Arthritis

Different origin in adult cattle versus calves. In adult cattle septic arthritis usually occurs as a result of direct inoculation or, more commonly, by local spread from infected peri-articular tissue. The most common sites for septic arthritis in the adult cow are the fetlock joint, carpus and tarsus, with fetlock joint infections from infections of the soft tissues of the foot being most common. Usually only a single joint is affected. *Arcanobacter pyogenes* is found in about 40% of joint infections in cattle.

In calves most cases of septic arthritis are from hematogenous dissemination from primary sites of sepsis, such as the umbilicus, lungs or digestive tract. Polyarthritis is common in calves. Gram negative

infections are common e.g in outbreaks of colibacillosis or salmonellosis. *Mycoplasma* septic arthritis should be considered particularly following cases of pneumonia or otitis media in calves.

Suspicion is raised by the presence of acute non weight-bearing lameness, joint swelling and pain and heat on palpation and manipulation of the joint. Bone lesions such as sub-chondral bone loss, osteomyelitis and periostitis may be visible on radiographs about 2 weeks after initial infection. Early intervention within 48 hours of infection is necessary to prevent irreversible changes.

Treatment: systemic antibiotics & NSAID's and stall rest (some limited movement allowed)are vital. Antibiotic therapy (beta-lactams in adults, broad spectrum in calves) should be continued for at least 15 days. Through and through joint lavage is useful; arthrotomy and arthrodesis can be considered in more severe cases. Amputation of the digit is an important option if septic arthritis of phalangeal joints occurs. Amputationis through distal third of the proximal phalanx.

## Nutritional and toxic

### Fescue foot

This is a non-infectious condition of grazing cattle cause by the alkaloid vasoconstrictive agent ergovaline, present in tall fescue infested with the endophyte fungus *Acremonium coenephialum*. This grass is well adapted to wet, heavy, poor soils and is cold resistant. It is very popular for winter grazing of stocker cattle in the south but is found widely, especially on beef cattle farms in the northern states.

Cattle grazing endophyte infested fescue can be affected by summer toxicosis or 'summer slump' (reduced production & hyperthermia) in hot weather, and fescue foot in winter. In summer the vasoconstrictive effect of ergovaline is probably responsible for hyperthermia because skin cooling is reduced, as well as in winter for the gangrene and sloughing of the digits and of tail tips.

### Enzootic Nutritional Myopathy *(Muscular Dystrophy, White Muscle Disease,)*

Seen occasionally in newborn calves, but more usual in older calves and yearlings. Associated with diets deficient in selenium. Selenium is a component of glutathione peroxidase (GTH-PX) and GTH-PX measurement in red blood cells is positively related to selenium levels in blood and is an important diagnostic and investigative tool.

In Selenium/Vit. E responsive nutritional myopathy of calves and lambs it is thought that deficient diets allow widespread tissue lipo-peroxidation which results in hyaline degeneration and calcification of muscle fibers. There is release of enzymes such as CPK which are important markers of muscle damage. In heart muscle, degeneration is followed by replacement fibrosis, giving the characteristic white streaked appearance.

Calves have stiff gait, long periods of recumbency, difficulty in rising, muscle tremors if forced to stand and may collapse, particularly after exercise. Calves eat and suckle if helped and do not show

neurological abnormalities. The heart rate is usually elevated and there may be dyspnea if diaphragm and intercostal muscles are affected.

Most animals respond to treatment with selenium/vit. E injection within 3 - 5 days. All other animals in the group should be treated. Bo-Se (*Schering-Plough)* (1mg/ml Se +50 mg Vit. E) is formulated for calves , ewes and lambs. Mu-Se (5mg/ml +50 mg Vit E) is formulated for adult cattle.

### Rickets

Rickets is a disease of young, growing animals. The cartilagenous matrix of the growth plate fails to mineralize. Rickets is a result of Vit. D or phosphorus deficiency. Most likely to see in winter housed calves on very poor diets.

There is usually deformation of the forelegs and enlarged carpal joints. Calves have large joints because the epiphyseal plates are enlarged. Bone deformity is due to the effect of weight bearing on softened bone when the animal stands.

## Miscellaneous Conditions

### Spastic Paresis *(Elso heel)*

This is a progressive disorder seen predominantly in Holsteins and Shorthorns. It is seen in calves from 2 – 10 months of age. Calves have extremely straight hind limbs with a tense contracted gastrocnemius, and difficulty getting up and down. The condition is thought to be caused by an exaggerated efferent response in the myotatic (stretch) reflex. They progressively lose condition and eventually are unable to stand.

Culling is recommended. Section of the gastrocnemius tendon or a tibial nerve resection have been attempted. The success rate is about 50%.

### Spastic Syndrome (*Cramps)*

Similar to spastic paresis but only in older animals, often old bulls. Affected animals extend their affected hind limbs to try and relax the painful contractions of the gastrocnemius. Slowly progressive. No treatment is recommended. Do not use as breeding animals because of a possible hereditary component.

### Hygromas *( carpal and tarsal hygromas (hock gall))*

Carpal hygroma is a localized swelling of tissues, including the precarpal bursa, dorsal to the carpal joint. It results from intermittent mild trauma to the precarpal area caused by lack of bedding or a poorly designed feed bunk. *Brucella abortus* may be isolated from the false bursa of some cases in countries where this organism has not been controlled. The lesion is a firm swelling, possibly fluctuating and up to several inches in diameter, located over the dorsal aspect of the carpus. If the animal is milking and eating well, hygromas should be left untreated. Most of the problems caused by carpal hygromas are

from treatment attempts, usually draining and infusion with corticosteroids, or attempted surgical removal.

Hygromas (hock galls) on the lateral surface of the hock result from repetitive injury from poorly designed or maintained free stalls, particularly lack of sufficient bedding.

### Interdigital Skin Hyperplasia *(Interdigital Fibroma, Corns)*

Corns are a mass of fibrous tissue between the claws resembling a papilloma. Often seen in fat cattle and as a proliferative response to chronic trauma to the foot caused by poor flooring. Remove by surgical excision or cryosurgery, followed by a hoof bandage, if causing lameness.

### Degenerative Joint Disease (DJD)

Progressive deterioration of articular cartilage with variable degrees of periarticular osseous remodeling. Often related to direct trauma and influenced by abnormal weight bearing or poor conformation. Age related – often seen in older animals. Onset may be insidious or follow an acute injury. The condition is usually progressive and leads to decreased performance or inability to function.

The larger weight bearing joints are most often affected, and they show effusion and pain. Therapy is palliative and these cows are eventually culled for “feet and legs” or “repro” failure.

### Osteochondrosis

Osteochondrosis is a failure of differentiation and mineralization of chondrocytes in the hypertrophic region of joint cartilage, leading to a failure of new bone formation. The result is an abnormal thickening of cartilage which may fracture and displace in the joint. High energy and protein diets appear to predispose to the condition and it may also have a genetic component. In cattle the stifle and the tarsus are the joints most commonly affected.

Onset of lameness is gradual, but animals become progressively more stiff and reluctant to walk. Joint distension is variable. Definitive diagnosis is by radiography.

Treatment: Conservative treatment with stall rest and NSAIDs is not very successful, whereas surgical removal of the sequestered cartilage and debridement of the cartilage surface by arthroscopic surgery is very successful. Debridement promotes joint surface healing and the formation of new fibro-cartilage.

### Stifle injury

As well as septic arthritis of the stifle joint (particularly in calves secondary to an infectious disease), other diseases occur. Cranial cruciate rupture occurs in adult cattle as a result of hyperextension of the joint, or as a result of fraying of the cruciate secondary to degenerative joint disease. Meniscal injuries often occur at the same time.

Upward fixation of the patella: Usually occurs in females 2-6 years of age. Surgical treatment by medial patellar ligament desmotomy is almost always successful.

## Contracted flexor tendons

Newborn calf, congenital shortening of the flexor tendons. Fetlock is flexed, sometimes the carpus. If the calf can stand you can glue a piece of wood to the sole, to add leverage to the extension forces that occur when the calf stands. Can also apply splint to palmar surface from pastern to mid metacarpus.

Surgical intervention is by section of the superficial flexor tendon, or both superficial and deep flexor tendons. Prognosis in severe cases is poor.

## Obturator and Sciatic Nerve Injury

This is not uncommon as a sequel to dystocia and assisted birth. The cow is bright and alert but either unable to rise or does so with difficulty. If you can get the cow up she knuckles over at the fetlock or cannot adduct the hind limbs (does the splits). Cattle with bilateral sciatic nerve injury may sit in a frog-like position.

Cattle with unilateral injury may be able to rise if there is good footing and assistance (by grasping the root of the tail and lifting as the cow tries to rise). Cows that can rise should be hobbled to prevent abduction and subsequent further injury, such as femoral neck fractures, coxo-femoral luxation, or myositis as a result of struggling to get up.

Cows may also be assisted with a variety of mechanical lifting devices, but be careful as some of these, especially hip-lifters (Bagshot Hoist), can cause further injury by crushing muscle tissue.

## Femoral nerve paralysis

Femoral nerve paralysis and lateral patella luxation often occur in newborn calves following dystocia. The stifle buckles and collapses because of weakness of the quadriceps femoris muscle and the hock flexes us well, but the fetlock does not knuckle. After a while there is obvious atrophy of the quadriceps.

## Coxofemoral Luxation

Luxation of the coxofemoral joint occurs when cows slip on slick floors as a result of muscle weakness during the peri-parturient period, particularly if metabolic disorders are present, and when mounted during estrus. In calves luxation occurs as a result of excessive traction during assisted birth.

Luxations may be cranio-dorsal or caudo-ventral. Cranio- dorsal fractures are difficult to distinguish on physical examination from a femoral head fracture. In a cranio-dorsal fracture the greater trochanter is on a line between the tuber coxae and tuber ischii, rather than ventral to them (forming a triangle of imaginary lines drawn between the three points). Cows with a cranio-dorsal luxation, if standing, have a leg that looks shorter than normal. The stifle looks big and is rotated outwards, and the hock is rotated inwards.

Cows with a caudo-ventral luxation are most often down when presented and have a worse prognosis.

Closed reduction is the method of choice if done within 24 hours of the injury, otherwise a surgical approach is necessary. Closed reduction is successful about two-thirds of the time.

## How to lift a cow's foot

### Front foot

- Cows can kick well forward with their hindfeet, so when examining a front foot, to avoid facial and head injuries, always rope the hindfoot (on the same side of the animal) first. The foot should be allowed to rest on the ground, but its movement forward should be restricted.
- If the cow is excitable, upset or frightened have an assistant apply a tail-jack, or consider sedation of the cow.
- Fasten a rope to the lame foreleg just above the fetlock, and well below the knee. Use a slipknot or a rope with a loop spliced at one end.
- Pass the rope over a rail at about the level of the cow's elbow, from the inside to the outside of the chute or stall.
- Loop the rope back around the leg at the same level as the original tie.
- Pass the rope over a lower rail at about the level of the cow's knee, from the inside to the outside of the chute or stall.
- Lift the foot, using the two passes of rope as a pulley.
- To make examination possible, bring the foot to the outside of the crush, either above or below a lower rail, and lash it securely to the rail so movement is prevented.

### Hind foot

- Use a slipknot or a rope with a loop spliced at one end. The rope can be fastened to the lame hindleg just above the hock, causing pressure on the achilles tendon and so restricting movement.
- It is important that subsequent movement is well restricted; otherwise kicking during examination can cause the operator's tools to be knocked, and driven into the operator's hands or other parts of the body, causing injury.
- The rope is then passed over a high rail, back around the leg above the hock, and then back to the same or a lower rail. Pulling on the rope will cause a pulley action. Once the foot is lifted, it is roped to a rail or upright securely so that movement up and down, or forward and backward is very limited.
- It is preferable that the rope is then held by an assistant rather than tying it. If the cow slips in the stall or chute, or goes down, it is important that the rope is released quickly to prevent dislocation of the hip.