Finding and treating lame cows

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Abstract

There are various opportunities for veterinarians to become involved in providing foot health services. The type of services that could be offered include lame cow detection and treatment, comprehensive hoof trimming, monitoring or training of farm staff, and routine monitoring of hoof health data. To take advantage of this potential practice growth opportunity, practitioners need to have a clear understanding of the diagnosis and treatment of common foot disorders. Due to the chronic nature of most foot lesions, early diagnosis of lameness is paramount. Treatment of digital dermatitis and foot rot requires the use of appropriate antibiotics. Treatment of sole ulcers and white line lesions require the removal of loose horn, application of a hoof block, and an appropriate resting space. The use of anti-inflammatory and pain relieving drugs should be considered for sole ulcers and white line lesions, especially when they are not chronic in nature.

Key words: bovine, cattle, lameness, lame, hoof trimming

Résumé

Les vétérinaires ont diverses opportunités de s'impliquer dans le service de la santé des onglons. Les services qui pourraient être offerts incluent la détection et le traitement des vaches souffrant de boiterie, le parage complet des onglons, le suivi ou la formation du personnel de la ferme et la surveillance routinière des données de santé des onglons. Pour profiter de cette opportunité potentielle de croissance pour la pratique, les praticiens doivent avoir une bonne connaissance du diagnostic et du traitement des troubles communs affectant les onglons. En raison de la nature chronique de la plupart des lésions d'onglons, le diagnostic précoce de boiterie est de prime importance. Le traitement de la dermatite digitale et du piétin nécessite l'utilisation d'antibiotiques appropriés. Le traitement des ulcères de la sole et des lésions de la ligne blanche nécessite d'enlever la corne plantaire excédentaire, la pose d'un bloc sur l'onglon et d'avoir un espace de repos approprié. L'utilisation d'anti-inflammatoires et de médicaments analgésiques doit être envisagée pour les ulcères de la sole et les lésions de la ligne blanche surtout lorsqu'ils ne sont pas de nature chronique.

Introduction

As the dairy industry evolves, the role of the veterinarian continues to change with it. Traditionally, veterinarians are trained in a large number of basic and advanced clinical skills, yet increasingly these types of veterinary tasks are being performed by on-farm staff. As a veterinary profession we have reacted to this shift by providing more consultative services. To provide these services successfully Nordlund[27] described several characteristics of successful veterinarians: they have intricate knowledge of herd data and, instead of having all the answers, they have positioned themselves as part of the management team so they can play a significant role in evaluating and implementing outside advice. Not surprisingly, veterinarians have gravitated towards providing services in areas where they have interest and sufficient clinical skills. Typically, these interest areas have included treatment and reproductive protocols, nutritional and feeding management, as well as young stock and milking management to name a few. One area that has received very little attention from practicing veterinarians is foot health management. This lack of attention is somewhat surprising as lameness is a painful, costly disease that affects the productivity of cows through its effect on milk production, culling, and reproductive performance.[2,4,7] In addition, lameness is also a major animal welfare concern as it is prevalent[16] and highly visible to the consumer. The objective of this paper is to give veterinarians a basic understanding of lame cow detection and the pathogenesis and treatment of the most common foot lesions. This understanding can then be used as starting point to begin providing foot health services and become part of a farm's foot health team.

Lame Cow Detection

The key to successfully treating lame cows is treating cases that are new and not chronic in nature.[36,37] It has been shown that up to 80% of cows with lameness had a previous lameness episode.[29] It is well established that the majority of lameness cases do not get noticed by on-farm staff,[12,39] yet it is has been shown that early treatment reduces the number of lame cows in the herd.[15,23] Detecting lame cows using locomotion scoring is a time-consuming activity in large herds and typically needs to occur 2 to 4 times/month. In addition to locomotion scoring there are alternative scoring systems[17,22] that veterinarians or technicians can use while providing other routine services, like pregnancy diagnoses, thus reducing time required for detection. The majority of lame cow detection systems are not perfect,[33] and successful use requires a trained person and appropriate record keeping.

Once detected lame, quick and effective treatment protocols need to be implemented. The rest of this paper provides background and treatment principles for 4 key foot lesions in a factsheet format. Multimedia versions of

these factsheets are available at http://dairyknow.umn.edu/topics/.

Digital Dermatitis

What is it

An infectious and contagious bacterial infection of the skin, commonly seen in the interdigital cleft of the foot.

How to recognize it

Digital dermatitis (DD) presents in a variety of stages ranging from painful, bright red ulcerated, or a less painful, grey/black, circular, granulomatous skin lesion. Edges can have a white margin and/or "hairs" protruding from them. Lesions are clearly demarcated and are typically located proximal in the interdigital cleft, but can occur on other locations such as in the interdigital space between the hooves or at the front of the foot. Severe lesions can become proliferative with filamentous projections or hyperkeratotic. It is useful to classify lesions into "active" (painful and ulcerative lesions > 2 cm) and "chronic" (grey/black hyperkeratotic lesions without painful ulcerative lesions >2 cm).[3,11]

Pathogenesis

Mechanical irritation of the skin and maceration by water and chemicals from manure weakens the skin barrier.[14,20] A synergistic group of bacteria, including *Treponema* spp, then invade and infect the weakened skin barrier,[21] leading to acute inflammation of the dermis and epidermis. These bacteria are common in the environment and normally live in the rumen.[40] There do appear to be some more virulent strains on some farms, as not all farms are infected with DD. *Treponema* species appear to be a necessary component of the group of bacteria to create disease.[14,20,21] *Treponema* species are gram-negative spirochetes that are microaerophilic and can encyst to protect themselves. As the bacteria invade the epidermis they can damage the different layers, and the body responds with a local inflammatory process that can result in the hyperkeratosis and proliferative lesions if the originating lesion is not treated in time.[31]

How to prevent it

The main focus of prevention is hygiene. Providing a clean environment without wet and/or abrasive walking surfaces decreases the chance of weakening the skin barrier. Footbaths are a preventative measure that should be used as frequently as necessary to prevent the occurrence of active painful lesions. Footbaths need to be at least 10 feet (3 m) long and are typically filled with disinfection solutions such as copper sulfate or formalin.[6] Other preventative measures include preventing infected animals from entering the herd, and possibly micronutrient supplementation of pre-calving heifers.[13]

How to treat it

Currently, no licensed products exists to treat DD in the USA.[1] Treatment typically consists of applying topical tetracycline-based antibiotics to active lesions using a wrap or a paste.[1,8,9] Wraps are not necessary but if they are used they should be removed within 24 hours.[9] The use of antibiotics requires an appropriate withdrawal time.[8] Non-antibiotic compounds typically containing heavy metals such as copper are also used with varied success.[18,19] The role of topical treatment is to treat active lesions and hasten their transition to chronic lesions. Once the lesion is chronic, it is the role of the footbath to prevent recurrence.[6]

Foot Rot

What is it

Foot rot is usually a sporadic infection of the soft tissues of the foot in dairy and beef cattle. Foot rot lameness can range from mild to severe lameness and usually has a sudden onset.

How to recognize it

Foot rot is recognized by the sudden onset of lameness accompanied by the symmetrical swelling of the lower leg above the hoof. Depending on the stage of the disease the interdigital skin splits open and putrid, foul-smelling discharge is noticeable. In more severe cases, loose pieces of necrotic tissue can be easily removed from the interdigital space.[38]

Pathogenesis

The most common bacteria associated with foot rot are *Fusobacterium necrophorum* subspecies *necrophorum*, *Dichelobacter nodosus*, *Trueperella pyogenes, Porphyromonas levii*, and *Prevotella intermedia* (the bacteria are all gram-negative anaerobes that are present in the GI system of cattle and thus their environment). To cause disease there has be a defect in the interdigital skin to allow opportunistic invasion by these bacteria. The bacteria then work synergistically to cause inflammation and necrosis of the soft tissues in the lower leg.[38]

How to prevent it

The key focus for preventing foot rot is on preventing skin damage. Skin damage typically occurs due to things such as rocks, sharp edges, or cables in the animal's environment. Skin damage can also occur due chronic wetting of the foot in muddy or wet and dirty environments. On dairy farms the use of footbaths with a range of disinfectants is used as an aid to clean and disinfect the interdigital skin.[6] Currently, there are no pharmaceutical products labeled with a claim to prevent foot rot.

How to treat it

Foot rot should be treated with systemic antibiotics according to label directions, and a variety of products are licensed.[1] There is typically no need to remove necrotic tissue or apply bandages. Treated animals should visually improve within 2 to 3 days. If animals do not respond, the

diagnosis should be re-evaluated. In severe cases the infection can spread to tendons and joints resulting in very severe lameness that is unresponsive to regular systemic antibiotic treatment.[38]

Sole Ulcers

What is it

Sole ulceration is 1 of the 3 most common causes of lameness affecting beef and dairy cattle. Sole ulcers typically occur beneath the flexor tuberosity P3 (third phalanx) of the outside hoof in rear legs, and are associated with varying degrees of changes in weight bearing.[36]

How to recognize it

Sole ulcers are recognized by the presence of severe hemorrhage or protrusion of the corium at the typical sole ulcer site.[36] Severe hemorrhages with an associated pain withdrawal reflex upon pressure with hoof testers should be considered early sole ulcers and treated accordingly.

Pathogenesis

Sole ulcers are due to continuous pressure by the flexor tuberosity of P3 on the corium. This pressure is caused by changes in the suspending and supporting structures of P3 due to mechanical and or metabolic processes.[25,30] This pressure initially leads to the corium leaking blood into keratinocytes at the dermal-epidermal interface. Over time this pressure from P3 leads to the destruction of keratinocytes and the interruption of horn growth, resulting in the corium protruding through the horn defect.[24] This pressure on the corium also initiates an inflammatory pathway resulting in long-term structural changes to P3 and the corium.[25]

How to prevent it

Prevention of sole ulcers consists of ensuring adequate lying time, minimizing negative energy balance, and an appropriate hoof trimming schedule.[30] To ensure a lying time of 12 to 14 hours, cows should not be away from their pen for more than 3 to 4 hours. In addition, forced lying time should be kept to a minimum, and effective cooling strategies to reduce the impact of heat stress on standing time should be implemented. It is important to make sure first-lactation animals are adjusted to adult cow housing at least 60 days prior to calving. Finally, the strategic use of an appropriately timed and correctly performed hoof trimming should be a key component of a prevention program.[35]

How to treat it

Sole ulceration results in chronic changes and is a painful condition.[25] Appropriate early treatment is critical to successful resolution of symptoms and to minimize the impact of long-term changes.[36,37] Treatment of sole ulcers involves the removal of all loose horn around the corium. This removal should occur delicately, with great care taken to minimize further damage to the corium.[32] Once loose horn has been removed around the lesion, pressure on the lesion should be reduced to maximize the speed of horn growth. The reduction of pressure on the lesion is achieved by the removal of horn around the lesion and by application of a properly sized hoof block to transfer weight to the sound hoof.[32] Cows with sole ulcers should be rechecked in 3 to 6 weeks to assess healing, and to either remove or reposition the block if necessary. Although currently not available in the US, the use of an NSAID in early sole ulcer cases should be considered to counteract inflammatory changes.[36]

White Line Disease

What is it

White line disease encompasses a range of lesions that typically occur in the abaxial white line region towards the heel on the outside hoof of the rear foot. On most farms it is 1 of the 3 most common causes of lesions and lameness in dairy cattle.[10]

How to recognize it

White line lesions can range from hemorrhages to separations and abscesses. Lame cows typically present with areas of white line separation that are painful when tested with hoof testers, or areas of more extensive hoof wall separation that can extend up to the coronary band. The presence of an abscess is variable, as the pressure it creates can either have drained prior to inspection or be discovered when following a painful separation. Typical location of white line lesions are in the abaxial white line of the heel area of outside hooves in rear feet, but similar type lesions can be found at different white line regions of the hoof and should be treated similarly.

Pathogenesis

The exact nature of the cause of white line lesions is unclear. What is known is that the white line is a made up 3 different types of horn, and this horn is weaker compared to the wall or sole horn.[5] Current thinking on the pathogenesis involve similar theories as described for sole ulcer pathogenesis where P3's suspensory mechanisms is compromised, and this results in damage to the keratinocytes that grow white line horn.[24,34] The presence of both shearing forces and weaker horn at the white line allows the formation of fissures. These fissures can allow the entry of bacteria and foreign bodies, resulting in damage to the corium and inflammatory changes to P3.

How to prevent it

Prevention of white line lesions starts with avoiding excessive trauma to the white line region by ensuring both cow walking surfaces and cattle handling protocols allow cows to walk at their own pace and not slip.[34] An additional prevention strategy is to incorporate the use of supplemental minerals (Cu/Zn)[26] and biotin[28] to increase horn strength.

Finally, the strategic use of an appropriately timed and correctly performed hoof trimming should be a key component of a prevention program.

How to treat it

White line disease can appear to be a very acute and painful condition; however, there are gradients of white line lesions and appropriate early treatment is critical to successful resolution. Similar to sole ulcers, treatment of painful white line lesions involves the removal of all loose horn around the lesion, including the wall. This removal should occur delicately, with great care taken to minimize further damage to the corium. Once loose horn has been removed around the lesion, pressure on the lesion should be reduced by thinning the lesion margins and lowering the heel to maximize the speed of horn growth. The use of hoof blocks, rechecks, and anti-inflammatories is similar to the treatments described for sole ulcer treatment.

Conclusion

Due to the chronic nature of most foot lesions, early diagnosis of lameness is paramount. The successful use of a lameness scoring system requires a trained person and reliable records. The treatment of digital dermatitis and foot rot requires the judicious use of antibiotics and appropriate withdrawals. Treatment of sole ulcers and white line lesions require the removal of loose horn, application of a hoof block, and an appropriate recovery place. In cows with horn lesions the use of anti-inflammatory and pain relieving drugs should be considered, especially when they are not chronic in nature. With the increased skills in the treatment of lameness cases, veterinarians will have the credibility to become more involved in foot health management.

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