

# AABP FACT SHEET

## SOLE ULCERATION



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**AABP LAMENESS  
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**Sole ulceration is one of the most debilitating, costly and common causes of lameness affecting beef and dairy cattle. Ulcers may occur in the typical site, beneath the flexor tuberosity of the third phalanx (sole ulcer), in the heel (heel ulcer) and in the toe (toe ulcer) depending on the location of the insult.**

### Pathogenesis

Ulceration is caused by an insult to the solar corium which results in disruption of horn production. The target structure involved is the dermal-epidermal interface (basement membrane and basal layer of the epidermis), which is the site of keratogenesis. The insult to the horn producing cells is caused by the pressure exerted by the third phalanx during weight bearing resulting from increased instability of the bone within the claw horn capsule.

Instability of the third phalanx may result from hormonal changes at calving time, which appear to be associated with an up-regulation of gelatinoprotease enzymes (such as certain metalloproteinases and 'hoofase') and an increase in the elasticity of the connective tissue between the third phalanx and the claw horn capsule.

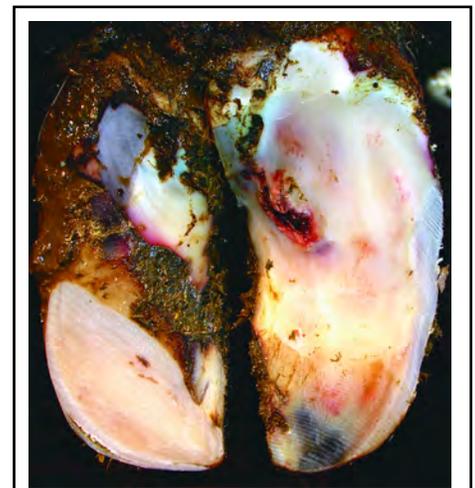
Similar changes may be triggered by nutritional events such as sub-acute ruminal acidosis (SARA), which may also trigger the same cascade of enzymatic events via release of an exotoxin from *Streptococcus bovis*, or alternatively lead to lamellar hypoxia and disruption via histamine release and subsequent arterio-venous shunting in the coronary band region of the claw. Lamellar hypoxia may also result from a severe bout of toxic mastitis or metritis.

Overgrowth of the heel and sole of the outer claw of the hind foot results in a shift in weight bearing toward the heel and increases the risk of mechanical trauma to the corium.

Ulceration most commonly occurs in the typical site (**Figure 1**)—directly below the flexor tuberosity of the third phalanx (sole ulcer), but may also occur closer to the heel along the fracture line where the soft heel horn meets the horn of the sole (**Figure 2**), and in the toe (**Figure 3**). Ulceration in the toe region may be caused by rotation of the apex of the third phalanx secondary to instability, but excessive hoof horn wear or removal may also predispose to lesions in this site (see white line disease fact sheet).

### Other Predisposing Factors

Factors that promote overgrowth of the heel and sole, which commonly occurs in the outer claw of the rear foot, predispose to ulcer formation. These may include confinement on concrete walking and standing surfaces, udder devel-



**Figure 1. A sole ulcer in the typical site, beneath the flexor tuberosity of the third phalanx.**

opment, and abnormal conformation. Improper trimming can also lead to abnormal weight bearing and predispose to ulcer formation.

Anatomical changes to the digital cushion fat pads as cows age may predispose individuals to lesion development.

### Important Things to Know About Sole Ulcers

- Ulceration of the sole is one of the most painful, costly, and common causes of cattle lameness
- Ulcers may occur in the typical site (sole ulcer), in the heel (heel ulcer) and in the toe (toe ulcer)
- Treatment involves removal of loose horn, thinning of the margin of the ulcer and the transfer of weight from the affected region to the sound claw through the application of a hoof block.
- Prevention is focused on appropriate transitioning of heifers into the lactating cow herd, optimizing cow comfort and rumen health and performing regular functional claw trimming.

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## Sole Ulceration *continued*



Figure 2. A heel ulcer trimmed out to expose the extent of the lesion.



Figure 3. A toe ulcer on the outer claw of the hind foot.

## Treatment

Sole ulceration results in chronic and intense pain. Thorough and early treatment is critical to success. Treatment of sole ulcers involves removal of all loose horn tissue, full exposure of the ulcerated area, thinning of the margins of the

ulcer and transfer of weight from the affected site. Weight transfer may be achieved through functional claw trimming, but when sufficient transfer of weight cannot be achieved by trimming alone, a hoof block should be applied to the sound claw (Figure 4).



Figure 4. A correctly placed hoof block allows the cow to stand squarely on the healthy claw and rests the diseased claw.

If granulation tissue penetrates through the ulcer it may be debrided under local or regional anesthesia to alleviate pain and shorten the healing time.

Bandaging the affected claw is not recommended unless the corium is excessively exposed, but in some severely affected claws, an antiseptic or drying agent may alleviate pain, accelerate healing, and reduce the formation of exuberant granulation beds.

Administration of a NSAID during the first few days following treatment will provide pain relief and improve appetite.

## After-care

Segregation to a pastured or well-bedded area is recommended for the lame animal with a sole ulcer. Any cow that has been blocked should be re-examined after approximately 35 days for re-trimming, block removal and assessment. If the lesion has not fully healed, the animal should be re-trimmed and blocked again for a further 3-5 weeks. Leaving blocks on for extended periods without examining the claw may lead to ulceration in the blocked claw. If a hoof bandage is applied, removal within 3-4 days is required.

## Prevention

Optimizing periparturient cow health and comfort is paramount for the prevention of sole ulceration. First lactation heifers in particular must be transitioned into the herd gradually, preferably separate from multiparous cows, so that they can get used to the environmental and nutritional changes before calving, without having to compete with larger mature cows. Rumen health must be maintained through provision of a well balanced, consistent diet in a situation where all cows may eat when they want to eat.

Attention to risk factors which result in increased time spent standing such as improved stall comfort, reduced time spent milking, and better heat abatement are also very important control strategies.

Finally, cows should be regularly hoof trimmed to maintain correct balance in order to reduce the effects of overloading of the outer claw. **AABP**