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Lameness Control in Dairy Herds

Part 4 - Sole Ulceration - Causes, Treatment and Control

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Sole ulcers affect approximately 6 dairy cows per 100 annually in the UK, but the range on UK farms is wide (0-54.8 cases per 100 cows per year). Sole ulcers can be a major cost to the dairy business, with the average case costing an estimated £324.17. Compared with the best UK farms that never experience sole ulcers, the annual cost to the average farm is approximately £2000 per 100 cows, rising to approximately £18,000 per 100 cows per year for the worst performing farms. The major costs are hidden within the reduced longevity, reduced fertility and reduced milk yield (Table 1 below).

Fig 1 (right) : A sole ulcer (red arrow) - classic position and appearance. The affected area in the picture is exposed quick which is sensitive and bleeds easily.

Table 1: Production and welfare statistics regarding sole ulcers

Measure of production and welfare	***Impact of sole ulcer compared with unaffected cows***
Reduced milk yield *	570kg
Increased culling	Culling 2.7 times more likely if a cow is diagnosed with a sole ulcer in the first 4 months of lactation
Infertility - Calving to 1st service - Extended calving interval - Extra inseminations	 11 days longer 40 day extension 0.72 extra inseminations per case

Higher yielding cows are more prone, so the effect has to be measured using predicted milk yield

However, it is perhaps the welfare cost which is of greatest concern, as sole ulcers result in chronic cases of lameness that require repeated treatments and in many cases lead to other secondary problems. They tend to develop following calving, appearing 4-5 months into lactation when cows are under the greatest production strain. They often start in the first few weeks of the first calving, going on to cause repeat and persistent problems in subsequent lactations.

Causes of sole ulcer

Sole ulcers are caused by the sinking of the pedal bone, with concussive trauma around a hooked process on the pedal bone, producing inflammation. This most commonly occurs in the outer claw of the hind feet. In the front feet, the inner claws are most commonly affected.

Fig 2: Trim, expose ulcer and relieve pressure of affected area

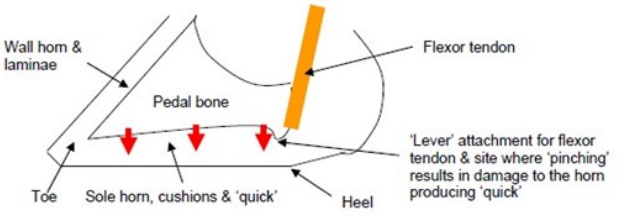

Figure 2a- A diagrammatical representation of the cross-section of a claw to illustrate the process of sole ulcer development. At calving the ligaments in the laminae slacken, allowing the pedal bone to sink and the quick next to the sole horn to pinch and bruise. Pinching is worst where the bony lever for the flexor tendon attachment occurs. Inflammation which starts at calving, prevents horn growth at this point, and persists until the pressure is relieved. The swelling due to inflammation in a closed claw space reduces blood supply, increasing inflammation further and preventing horn growth.

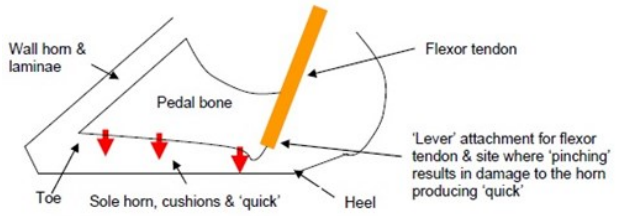

Figure 2b - Poor foot angle (low heels) or claw horn overgrowth further increases the overloading and pinching.

There appears to be no single factor contributing to this process. Factors can include:

- **Nutrition** - possibly causing claw overgrowth leading to physical 'pinching'.
- **Calving** - 'slackened' ligaments in the claw increase the chances of severe pedal bone sinking. Once sunk the pedal bone can never return to the position found prior to first calving.
- **Under-developed cushions** - especially heifers and thin cows.
- **Poor foot angle and claw overgrowth** - increasing overloading and pinching.
- **Standing on concrete** - these durations are likely to dictate whether cows recover from

the bruising and pinching following calving or go on to develop the exposed and infected quick 4-5 months after calving. This can be influenced by standing times while penned or voluntary standing while cows wait to lie down or feed.

- **Slurry contaminated conditions** - unclear mechanism; either softening and eroding the horn, or reducing the claw horn wear, leading to poor foot angles.

There appears to be no evidence that rough tracks contribute to sole ulcer, although the stones and uneven surfaces associated with rough tracks will highlight those cows with sole ulcers.

Treatment

Successful treatment of sole ulcers involves steps to relieve the pinching and inflammation, which is most effectively achieved by:

- Dutch 5 step claw trimming - steps 1-3 correct claw shape.
  - Often the lesion will be covered by overgrown and diseased horn, the lesion becoming apparent after stage 3. (Fig 2)
  - Step 4 relieves weight off the ulcerated claw by trimming (red line showing a height difference) (Fig 2) or by using a block.(Fig 4)
  - Step 5 involves trimming the loose collar of horn from around the neck of the sole ulcer and creating some flexible sole around the ulcer (red arrows) (Fig 2, Figs 3a and 3b).
- Providing soft surfaces under-foot (pasture, straw bedded yard)
- Encouraging cows to rest (free access to comfortable lying area and plenty of feed space) allowing cows to move around naturally (e.g. no rising restriction)
- Possible use of anti-inflammatory drugs

If caught early, claw trimming can be sufficient to prevent an ulcer protruding through the sole. However, in many cases the under-run horn reaches the sole surface allowing infection to track in to the quick. In these cases, the exposed quick becomes infected as well as inflamed, and a prolapse of the quick out the horn may occur which will take longer to recover.

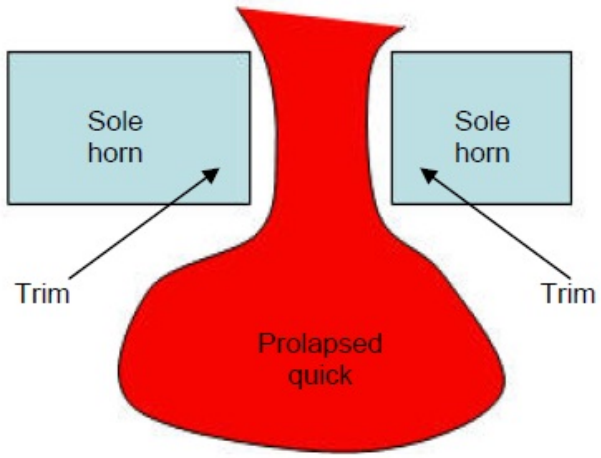

Fig 3a: schematic cross-section through the prolapsed quick before final trimming.

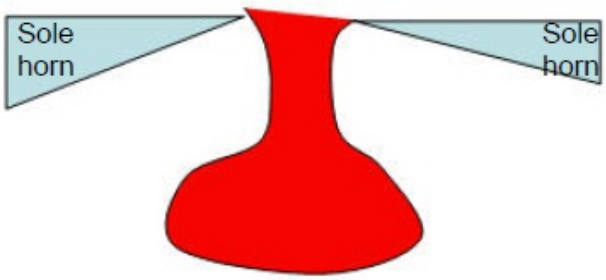

Fig 3b: Schematic cross-section through the prolapsed quick showing the ideal trim of horn around a sole ulcer. Sharp knives are essentila for this task. The prolapse should be left to shrink rather than be amputated.

Fig 4: Weight may be taken off painful claw by glueing shoe or block to sound claw.

Recovery will be influenced by:

Copper sulphate should not be used. Rough stony tracks will not help recovery.

- Hygiene at trimming and in the housing. If the quick can be kept clean and disinfected then healing will be rapid.
  should be considered. Always consult your vet on this approach.
- Bandages should be avoided in most situations as they retain slurry and are likely to increase weight-bearing on the affected cla

Prevention

Good nutrition is fundamentally important for the general health and productivity of dairy cows. However, there are no proven methods for reducing sole ulcers by altering diets alone, and the most effective preventative measures involve reducing standing on concrete, particularly at calving. Where sole ulcers are a herd problem, the following measures should be considered (in approximate order of importance):

period for at least 1-2 weeks after calving, if not for 8 weeks.

- Allowing access to a clean, dry and hygienic lying area combined with palatable feed immediately cows exit the parlour.
- Reduce enforced standing times at times other than milking. Cows are inevitably penned up away from food, water and lying area for foot trimming, AI, mucking out or the vet routine.
- The standing time should be minimised. Whenever possible, lying space, feed and water provided in holding areas.

surface, cubicle dimensions and stocking rates should all be considered.

- Routine claw trimming using the Dutch 5 step method (see previous module).
- Cubicle training of heifers during the bulling or early in-calf period. Tying heifers or cows in cubicles must be avoided.
- Improved walkways and cow flow to reduce cow waiting times.

Fig5: When feasible provide straw yards for 4 weeks before calving and 8 weeks after calving.

Fig 6: Lying surface, cubicle dimensions and stocking rates should all be considered.

Sole ulcers take several weeks to develop. Once pedal bone sinking and bruising of the quick has occurred, sole ulcers will tend to recur, usually 4-5 months into each lactation. This places great importance on strategies to prevent new sole ulcers from developing. Control strategies should be monitored using each new crop of first-calved heifers, calculating the percentage of first-calved heifers recorded with sole ulcers.

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