

Solar Ulcers & Their Prevention 1

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Solar ulcers and prevention

The national incidence rate of lameness, (i.e. the number of cases per cow per year) is reportedly the highest in the world. Solar ulcers are the main cause of non-infectious lameness in the UK. In order to reduce the lameness problem it is important to understand the reason why cows go lame.

If we look at the anatomy the cow walks on the equivalent of two of our fingers. The final bone within our digits is akin to the pedal bone within each claw. Horn grows out of the corium, similar to our nail bed. Structures called laminae interlock with the horn which, along with tendons and ligaments, helps protect and support the pedal bone.

The laminae have a very rich blood supply, and when inflamed (laminitis), sludging and shunting of the blood occurs. This can be shown as sole haemorrhage, soft yellow horn (caused by fluid leakage), double sole (fluid accumulates whilst horn is growing out), widening of the white line and solar ulcers. From time of insult within the claw, it takes about six weeks for these lesions to be visible on the outer surface of the horn. Experts argue over how much these lesions are due to feed related laminitis or physical factors.

In solar ulcers the pedal bone sinks within the claw capsule, putting pressure on the solar corium (just above the sole horn), thus causing the lesion. In dairy cows they occur generally between one and three months after calving. Given the time it takes for lesions to grow through the horn, it is likely the period of danger is around calving. Researchers in Bristol University have found that at calving, the connective tissue supporting the pedal bone softens similar to the ligaments of the tail head. The bone can then oscillate within the capsule hitting against the solar corium.

Between the pedal bone and the solar corium lie digital fat pads, like the fat in our fingers. These are important in dissipating the force between the pedal bone and the solar corium. They are arranged like

the triple cushioning in running shoes. Heifers have not functionally developed cushioning, although old cows have large fat pads, (think Dolly Parton!). Therefore heifers are more prone to damage to the solar corium. Once the fat pad is damaged, (Figure 3), the fat is replaced with connective or scar tissue. This is thought to be irreversible and the scar tissue formed cannot absorb the force like the fat pads. This is why once an ulcer forms, it is very likely that it will reoccur and why it is crucial to prevent lameness in heifers.

The shape of the sole is an important factor in the shock absorbing system within the claw. The normal weight-bearing surfaces of the claws are the wall, outer part of the sole, and the bulb (Figure 4, courtesy of T Mankse). The horn at the wall is of different type to the solar horn and possesses different wearing properties. Animals at pasture maintain this concave shape, as the solar horn is able to shed itself. Once housed, slurry exposure softens the horn and the solar horn cannot shed as easily. The wall wears faster on the concrete and as a result the foot becomes flatter. This ensures more weight is taken on the solar region, which is not designed for high load bearing and again the pedal bone is putting pressure on the solar corium. Overgrowth at the toe also causes increased compression on the solar corium. The long toe and resulting shallow claw angle ensure that weight is transferred to the back of the claw, and again the pedal bone moves further down within the claw.

Why do outer claws on the hind leg suffer most lesions?

As you will all know, the outside claw on the hind leg is the one where you will find the majority of lesions. A pregnant and/or heavily bagged cow will adopt a wide stance with hocks turned in, (this is partly genetic in origin). More pressure is put on the solar region, stimulating more horn growth, thus exacerbating the situation. This has always been the main theory, however bulls are also more prone to lesions on this outer claw.

A research group in Zurich looked into this problem. They examined the hooves of healthy claws in dead cattle, before and after functional or 'Dutch method' trimming. It was discovered after dissecting the trimmed claws that the pedal bone in the outer claw was sometimes closer to the solar corium than the inner claw. However the pedal bones are known to be the same size. This caused a lot of debate in the foot-trimming world, as it hypothesised that trimming to match the inner claw may occasionally lead to the solar horn in the outer claw to be too thin.

The group did further work to find out why this occurs. If you close your fist and look at your knuckle joints they do not stop level. The bones leading up to them (metacarpals, or metatarsal in hind legs) are of different lengths. After dissecting heifers and young bulls, it was found this is the case in the bovine as

well. The outer metatarsal in the hind leg is slightly longer as is the inner metacarpal in the foreleg. It is proposed this difference in length may get more pronounced as the animal ages. This would lead you to think that the outer claw would take the impact first when walking on a flat surface. The group then tested this. They put Brown Swiss heifers on a treadmill and used high-speed digital photography to record their gait. In slow motion it was obvious that in the hind legs the outer claw always hit the ground first before the inner claw.

If the outer claw is always receiving the impact first, it is no surprise that it suffers the most from lesions. Concrete offers no 'give'. When the cow walks or runs on pasture the two claws would share more of the load, as both claws are allowed to sink and share the weight better. On concrete there would be less load sharing and perhaps more stress on the outer claw. Again, increased pressure on the solar horn would cause more horn growth making the situation worse.

In the next article we will look at how we can perhaps reduce these effects.