



## **How sore are your horse's feet?**

### ***Quantitative assessment of pain from laminitis in Horses***

#### ***What is the essence of the study?***

This study was supported by BVAAWF at the Royal (Dick) School of Veterinary Studies, University of Edinburgh, to find a better method for routinely assessing the sensitivity of the feet of horses with laminitis and for determining the effectiveness of old and new treatments for pain from laminitis, by regular measurement of the horses' response to hoof testing.

#### ***The 'scourge' of Laminitis.***

Any horse is at risk of suffering from laminitis and this study was supported as a contribution to the ongoing BVAAWF / BEVA initiative to make progress in the understanding, prevention and treatment of this devastating condition.

Laminitis has been recognised since horses have been used and managed by humans, and it continues to be a common problem, with about 7% of horses affected in the UK, and about 20% of foot problems in winter and 40% in spring in the United States. It has catastrophic effects on the performance and welfare of affected horses, and the costs of treatment can be both high and prolonged.

Laminitis is an inflammation of the laminar structures which attach the horny hoof to the bone and distribute the weight of the horse from bone to hoof over a large area of attachment. It is well-recognised, not only from the characteristic postures, restless activity, lameness, warm feet and increased digital pulses shown, but also from the severe and enduring pain suffered by the horse.

The causes of laminitis are not yet adequately understood, although there is increasing evidence that it is a complex nutritional, metabolic and management disease which damages the blood vessels supplying the laminae. This damage results in weakening of

the bond between the horny laminae of the hoof and the sensitive laminae attaching the hoof to the bone. This weakening allows separation of the bond to occur, under the weight of the horse, and the bones then sink within the hoof. In extreme cases the hoof becomes detached. These processes can occur rapidly and, often, by the time that clinical signs are seen by the horse's keeper, the laminar tissues have already been extensively damaged. This can make effective treatment almost impossible.

### ***Can laminitis be prevented?***

Many attempts have been made to find ways of preventing laminitis, and considerable success has been achieved by good dietary management, appropriate exercise and constant awareness of the state of the horse's feet. Thus there are some generally accepted 'good practices' but they are not simple, easily applied, solutions to the problem.

### ***How is laminitic pain treated?***

Intense acute and chronic pain can occur with laminitis, which are not always relieved by the usual analgesic treatments for pain in horses, such as the aspirin-like or morphine-like drugs. Consequently, for humane/welfare reasons, severely laminitic horses often have to be euthanized to end their suffering.

### ***How is pain from laminitis currently assessed?***

Effective pain relief requires accurate, reliable and practical pain assessment, which is generally achieved by careful observation of changes in the gait, stance and activities of the horse, and can be supplemented by the use of traditional (manual) hoof testers to recognise and assess changes in the sensitivity of the feet by pressing on the sole. Extensive experience is required to develop the skills necessary to make reliable and sensitive assessments, but poor agreement can still occur between assessments by the same clinician on different occasions, and by different clinicians. Such assessments would benefit from validation and calibration against one or more quantitative (objective) measurements, commonly referred to as Quantitative Sensory Testing (QST).

### ***The new Hoof Tester:***

A new hoof tester for measuring nociceptive (pain) sensitivity in horses suffering from laminitis has been developed, tested and validated. It is hydraulically powered and applies a gradually increasing pressure to the sole of the foot through a probe with a round, flat contact area of 100 mm<sup>2</sup>. It is applied in a similar way to a conventional manually operated hoof-tester, except that the probe is advanced hydraulically, at a controlled rate of increase in pressure. The pressure is applied against a curved metal 'anvil' with a non-slip surface, positioned opposite the probe on the outer wall of the hoof.

A test on the hoof is started when the *operator* (i.e. the person holding and testing the foot) presses a micro-switch on the handle of the hoof tester to apply increasing pressure, when the first withdrawal reaction (*threshold*) of the horse is detected, the switch is released and the pressure is removed. For safety reasons, pressure on the probe is released automatically if/when a predetermined maximum (*cut-off*) is reached. This *cut-off* is included to help prevent damage if, unknown to the *operator*, the foot is insensitive due to anaesthesia /denervation, or if no response is detected.

The pressure applied by the probe is continuously measured from the output of an 'in-line' calibrated load cell and is electronically recorded on a lap-top computer. The output of the load cell is also used to control the rate of pressure application and the automatic maximum '*cut-off*' point.

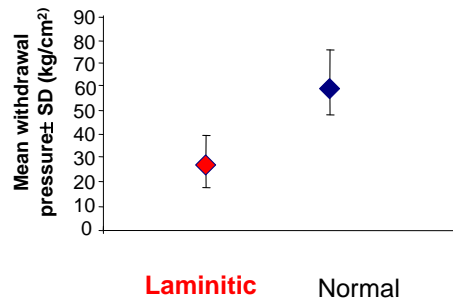


### ***What has been found, so far?***

So far, the withdrawal thresholds in the forefeet of laminitic horses have been compared with each other and with those of non-laminitic, non-lame horses.

Results show that average thresholds measured at three different sites on the soles of the forefeet of chronic laminitic horses were lower by about 50% than those of normal horses.

*(Data: means  $\pm$  SD; n=7: 58.76  $\pm$  14.31 kg/cm<sup>2</sup> for normal horses; 30.00  $\pm$  11.39 kg/cm<sup>2</sup> for laminitic horses).*



### ***What do the results mean?***

The results indicate that this approach to Quantitative Sensory Testing may help development of a valid, reliable, accurate, sensitive and practical method for the recognition and repeated assessment of the severity of chronic laminitis suffered by individual horses.

The results help to quantify the increased sensitivity to localised and generalised pressure, on the soles of the feet, associated with chronic laminitis. This is further evidence that chronic laminitis generally produces pain of a severity sufficient to require remedial action.

The results also support the use of Quantitative Sensory Testing, in future studies, to measure the efficacy of current and new analgesic treatments for relief of laminitic pain, and to help validate/calibrate other pain assessment methods.