Tough hooves are the pillars of a horse. They are sturdily designed with the architectural principles of curves and arches, with each component held tightly together as a unit. Vital to the overall strength of this unit is the line of laminar ‘leaves’ that joins the wall to the sole. This is a dynamic seam that allows the growing wall to ‘slide’ past the sole without compromising integrity; an engineering masterpiece.

In a healthy hoof, the laminar line is such a tight bond that it is virtually invisible to the naked eye (See photo 1 above). Unfortunately, this sole to wall junction is also potentially the weakest link and a large number of domestic horses have hooves that literally come apart at the seam (see photo 2 on opposite page). When this happens, all of a horse’s weight is pushing down on weak, unsupported hooves and the growing hoof wall migrates away from the pedal bone, leading firstly to flaring of the hoof wall itself, then to mechanical breakdown of the laminar line and finally to separation of the wall from the sole.

This is one of the great frustrations of horse owners and so often has them reaching for shoes just to ‘hold’ the hooves together (see photos 3 and 4). What causes such an important part of the grand equine design to fail? There are two issues at play – mechanics and metabolics.

Mechanical stress

The laminar line is often subjected to unnatural mechanical stress. Unless the frog is on the ground where it can support the middle of the hoof, the vertical stress is fully transferred to the laminar line, literally forcing it to suspend the whole weight of the horse. It is simply not designed to do this. See photo 5 on page 53, which shows a cadaver hoof cross section with the hoof wall bearing weight through walls only. If the hoof capsule was meant to be an engine mount, it would need to be inverted the other way! This scenario of mechanical distress can be avoided quite simply by trimming a hoof to keep the frog weightbearing – and its entire surface area (hooves should be trimmed to this parameter if possible, but don’t over-shorten heels to get a diseased frog onto the ground). Regular maintenance trimming (every 2-3 weeks) is the key because the frog is able to remain as a primary weightbearing structure at all times.

The frog needs to be well grounded. Photo 6 on page 53 shows a cadaver hoof cross section fully weightbearing. Trimming also needs to follow physiologically correct parameters in terms of weightbearing distribution and both the quarters and outer wall should not have significant weight bearing responsibility (only the inner wall should bear weight). Most importantly, the toe should be kept short. It is also beneficial to keep a horse out of shoes whenever practical and, if your horse ‘needs’ to be shod, consider using wide web, flexible plastic shoes which support a large area of the hoof, including at least some of the frog.

Mineral balance

Trimming may well take away mechanical stress, but the ultimate path to tightly bonded hooves is to grow a strong laminar attachment. Growth obviously originates at a cellular level and the creation of cells that have optimal health requires a balanced availability of minerals. A major part of the strong hoof equation appears to be fine tuning a horse’s mineral balance.

Minerals are required by all living organisms for literally thousands of metabolic processes. Minerals seldom act alone. They interact with numerous other minerals and indeed relate to other minerals in homeostatic ratios, so not only do they need to be present in the horse’s system in adequate quantities, but they need to be balanced in comparison to other minerals. If only one mineral is limited or in too great of a concentration, the whole system will not function correctly, especially the hooves.

This article can only be a brief synopsis of why there may be mineral shortages – especially magnesium - for horses grazing pasture. A logical question to ask is why large herbivores didn’t evolve in Australia; is it because the landscape is too old and devoid of minerals to sustain large animals? In addition to this, Australian soils are mostly quite acidic which also greatly affects the availability of many minerals to plants, especially magnesium.
Adding to the magnesium problem, even if the ingested food has enough magnesium, there are several scenarios that may inhibit a horse’s ability to absorb it, including a diet high in simple sugars (that would be most horses in the ‘settled’ areas of Australia). The magnesium picture is actually quite a complex web.

Excessive calcium inhibits magnesium uptake. Unfortunately, there has been a tendency to over-simplify the mineral balance picture and concentrate – almost anthropomorphically – on calcium supplementation. Human nutrition seems very much focused on calcium.

There is also a link between potassium and magnesium, whereby excess potassium is known to cause magnesium shortage. Field trials have been able to replicate significant improvement in hooves that have previously been pathologically weak by the addition of a significant quantity of magnesium.

Adding to the problem of Australian soils is the history of fertilizer use which has been necessary to enhance agricultural profitability from such naturally mineral deficient soils. One of the main nutrients used has been potassium. One of the main nutrients used has been potassium.

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Magnesium has been a difficult mineral to supplement effectively, but Pauline has been pioneering the use of magnesium chloride which is easily assimilated by horses (it is actually a naturally occurring salt that is sourced from central Asia, from the area that horses evolved in). The cats are starting to line up on the fence!

Pathogens

Any discussion of flaring and separation needs to consider pathogens, because a common complication of laminar line weakness is opportunistic invasion of pathogens such as bacteria and fungi. This creates pressure that damages the pedal bone and leaves a permanent weakness.

It is an insidious problem because the ‘bugs’ break in and cause separation at the heel quarters, this is called white line disease. Even though the bugs involved are the same as at the toe, the problem is much harder to control at the heel quarters. It needs to be at least partially resected and also treated topically with phenyle.