Laminitis affects so many horses and ponies that it is now the most researched aspect of lameness worldwide. This research continues to explain why certain horses and ponies do not respond to correct dietary management alone and also tells us more about how we should manage susceptible horses and ponies.

Laminitis is a disease of the foot that can vary in severity from the merest hint of lameness to a situation described as ‘sinking’, which can be fatal. As laminitis develops the attachment of the pedal bone to the hoof wall starts to fail, leaving the pedal bone to rotate and point towards the sole, and in the worst cases to sink right through it.

International research has made it abundantly clear that laminitis is multi-factorial, that means there is normally more than one factor involved before a pony is ‘tipped over’ into laminitis. It may be helpful to think of a threshold over which laminitis is triggered. A pony may have trotted too fast down a rough, stony track causing mechanical damage; this will raise his ‘at risk’ line towards the threshold. He may also be genetically predisposed to insulin resistance; this will raise his ‘at risk’ line further. Finally he may have access to too much high-sugar grass and suddenly his ‘at risk’ line is pushed over the threshold and he goes down with laminitis.

When we think about the nutritional causes of laminitis our first thought is to an overload of carbohydrate (mainly starch) into the hindgut. Over the years a huge amount of research has built up to demonstrate the consequences of such an overload on firstly the microbial balance in the hindgut and ultimately the weakening of the support given to the pedal bone in the foot by the laminae.

More recently researchers have demonstrated that obesity not only adds to the mechanical weight that the laminae have to support but also has a direct negative effect through the hormonal activities of the fat cells within fatty tissue, especially around the stomach (omentum) and in the crest.

However the latest research points to an even greater role for nutrition because it has long been known that increasing amounts of glucose entering the bloodstream from the small intestine, that is before the hindgut, cause a rise in the level of insulin. The most recent research shows that high levels of insulin in the blood directly precipitate laminitis.

Adding all this research together means that not only must we be careful not to feed horses prone to, being treated for or recovering from laminitis a diet that could lead to a carbohydrate overload in the hindgut, for example one containing too much starch, but we must also be careful to avoid feeding a diet providing too much sugar in the form of, for example, molasses. Whereas we used to consider that because molasses had a high glycaemic index, that is it was virtually all digested in the small intestine and absorbed through the intestinal walls, it did not reach the hindgut unless fed in excessive amounts and therefore did not pose a major risk. It is now evident that sugar levels in the diet need to be minimised in order to avoid a rise in insulin levels.

It is really important to remember that laminitis is a multi-factorial problem and that even if your horse or pony has laminitis caused by a non-nutritional factor, for example Cushing’s disease or traumatic injury, it is very important to minimise adding to the factors that could trigger or worsen the laminitis. In other words, whatever the cause, it is important to feed a low sugar, low starch, high fibre diet, with calorie intake controlled when necessary.
Recognised risk factors for laminitis include:

1) Excessive intake of sugar and starch (soluble carbohydrates), for example:
   a) Eating too much high-sugar/fructan grass, often in spring or autumn, but possible at other times of the year e.g. after frost. Research has indicated that stressed (e.g. closely grazed) or frosted grass is high in fructans, a type of storage sugar (oligosaccharides) that cannot be digested by the horse itself, so passes through the small intestine undigested to the hindgut where it triggers similar changes to a starch overload. This helps to explain the cases of laminitis seen in horses and ponies kept on ‘starvation’ paddocks or turned out in very cold or frosty weather. Further research has shown that sugar levels in grass buried under snow can be higher than previously thought at around 15% so this poses a further risk. One survey in the UK showed that 61% of laminitis cases occurred in animals kept at pasture.
   b) Eating too much cereal-based compound feed, especially if highly molassed.
   c) Eating too much cereal, either in one feed or in successive feeds.
   d) Eating too much high-sugar/fructan grass, for example:
      a) Eating too much cereal-based compound feed cut them out of the diet.
      b) In those cases where excessive intake of sugars and/or starch is the final trigger for an attack nutritional advice should centre on two aspects:
         1) Reducing sugar and starch intake to a minimum in case an insulin response is involved.
         2) Re-establishing the correct bacterial population, and hence the correct acidity, in the hindgut. This is one in which fibre-digesting bacteria dominate and bacteria which digest sugars and starch are not allowed to proliferate excessively.

All these situations will result in an overload of soluble carbohydrate into the hindgut, which will cause an imbalance in the resident microbial population. When an excess of sugars or starch overflows from the foregut into the hindgut it is digested by a minority of the bacteria present especially Streptococcus lutetiensis. These bacteria then multiply very rapidly, producing lactic acid as they do so. Research has shown that as the hindgut becomes more acidic its walls become permeable (leaky) and one theory is that laminitis trigger factors (LTF’s) ‘leak out’ into the bloodstream. When the LTF’s reach the foot they cause changes that remain the subject of intensive research by scientists around the world. These changes precipitate laminitis.

All these situations also result in temporarily raised insulin levels in the blood, which may also trigger laminitis.

2) Obesity is a risk factor for laminitis because internal fat, particularly in the abdominal region (omentum fat), is hormonally active, excreting hormone releasing factors, hormones e.g. cortisol, and inflammatory factors that can all ultimately trigger changes in the foot that lead to laminitis. Obese horses also put more load on their feet. Obese horses that are also IR (Insulin Resistant) or suffering from EMS (Equine Metabolic Syndrome) are more likely to develop laminitis.

3) Hormonal e.g. PPID (Cushing’s disease) IR or EMS. It has been estimated that 28% of the native ponies in Australia are IR. It has also been estimated that 50-80% of horses with Cushing’s disease in Australia suffer from clinical laminitis. More than 80% of laminitis cases reviewed in Australia and Finland had hormonal involvement. It has been demonstrated recently that simply administering insulin (to achieve approximately 3-4 times normal levels in the blood) precipitates laminitis in lean, healthy horses after 48 hours. Furthermore the very latest research has shown that MMP's (enzymes involved in normal modelling of lamellae) are not significantly involved in this process. Please ask for our separate article detailing these very significant risk factors which are now known to explain a great many cases where correct dietary management alone is insufficient to eliminate laminitis permanently.

Certain drugs affecting the hormone system e.g. corticosteroids, are known to have the potential side effect of triggering a laminitic attack.

4) Stress e.g. when travelling long distances or separated from field companions. This could be considered a hormonal risk factor.

5) Traumatic laminitis is caused by repeated physical trauma to the feet during e.g. endurance riding, driving, or jumping on hard ground; it can also be caused by over-enthusiastic hoof trimming.

6) Severe lameness in one limb will cause a horse or pony to carry excessive weight on his other limbs, which may cause laminitis. As with traumatic laminitis this is a physical trigger but one that is caused by pressure blocking the capillary blood supply to the weight-bearing foot. This appears to be a clear case of severe vasoconstriction causing laminitis.

7) Toxins released by bacteria during certain illnesses e.g. following retained placenta, colic, diarrhoea, liver or respiratory disease.

Is there a cure?

Most horses and ponies can recover from laminitis but the extent of their recovery depends on many factors including how severe the problem was when it was first spotted, and how soon treatment commences. The very mildest (sub-clinical) nutritionally-triggered, cases can often be nipped in the bud by changes in management, notably feeding. Clinical cases need the urgent attention of a vet. Acting quickly and using the combined skills of a vet, farrier and nutritionist lays the foundation for the most successful recoveries.

What action should be taken following an attack?

In those cases where excessive intake of sugars and/or starch is the final trigger for an attack nutritional advice should centre on two aspects:

1) Reducing sugar and starch intake to a minimum in case an insulin response is involved.

2) Re-establishing the correct bacterial population, and hence the correct acidity, in the hindgut. This is one in which fibre-digesting bacteria dominate and bacteria which digest sugars and starch are not allowed to proliferate excessively.

The first action to take therefore is to remove the ‘tip-off-the-threshold’ cause of the laminitis e.g. bring the pony in from grass or, if the pony was previously receiving any cereals and/or cereal-based compound feed cut them out of the diet. Stable the horse or pony on a deep bed of shavings. Provide ample fresh water. Call the vet immediately and the farrier when appropriate. Do not remove shoes unless, following X-rays, your vet advises your farrier to replace them with e.g. heart bar shoes. Discuss what to feed with an experienced nutritionist. It is important to minimise the levels of sugar (including fructans) and starch in the diet but to provide ample fibre. Never starve a laminitic as this can have fatal consequences.

If the horse or pony is underweight offer low-NSC-hay (less than 10% non-structural carbohydrate), ad-lib. Non-structural carbohydrates include simple sugars (mono and di-saccharides) oligosaccharides (including fructans), starches and soluble fibres. But if he is overweight feed hay ad-lib for no more than a week, to help re-establish the correct hindgut microbial balance, then gradually drop to 1.5% of ideal body weight over a few days. Whilst you are waiting for hay to be analysed either 1) soak it in plenty of cold or lukewarm water for twelve hours as this allows a significant percentage of the sugars it contains to leach out into the water or 2) feed a low sugar/starch chop hay replacer, such as TopChop Lite, which contains no more than 3% sugar and starch combined. Recent trials at TopSpec’s Equine Research Unit at Middle Park Farm have shown that feeding TopChop Lite as a hay replacer is significantly more effective than using unsoaked hay. This may prove to be a very useful alternative to soaking hay in the cold months of winter and possibly the only alternative in freezing conditions if you do not have less than 10% NSC hay available.

A pony at grass carrying too much condition and therefore at risk of Laminitis.
A typical initial regime for a small native pony would be to offer 2kg of an unmolassed alfalfa/straw chop e.g. TopChop Lite, and one small flap (2.2kg) of late-cut, low NSC hay spread out over 24 hours. Because such a regime is deficient in micronutrients it is essential to feed horses and ponies a broad-spectrum supplement to enable tissue repair and maintenance to take place.

A pelleted, fully comprehensive supplement that includes yeast products and optimum levels of the nutrients needed to improve hoof quality is ideal. High levels of anti-oxidants are helpful in removing excess free-radicals and magnesium may help to increase insulin sensitivity. Pure, protected yeast creates beneficial conditions for the growth of the fibre-digesting bacteria in the hindgut. Another yeast product, MOS (mannan oligosaccharides) binds to undesirable bacteria and removes them from the entire gut in the faeces, leaving the beneficial, fibre-digesting bacteria free to multiply. As the beneficial bacteria multiply the acidity of the hindgut is reduced. These features are all combined in TopSpec AntiLam, an innovative, palatable, pelleted multi-supplement. The 280kg pony in the example above would need 280g TopSpec AntiLam per day, preferably divided into two feeds.

The nutritionist will slowly improve this regime to provide a more nutritious diet according to the progress of each individual case. Whenever possible the diet should remain fibre-based and low in sugar/starch, taking advantage of the wide range of such products available today. These include products like TopSpec FibrePlus cubes, unmolassed beet pulp and unmolassed alfalfa e.g. TopChop Alfalfa. The old adage of feeding little and often is particularly important.

Keep the horse or pony on box rest until he is sound and off all painkilling drugs. Forced exercise when pain is masked by drugs will lead to further damage to the foot. Nonetheless exercise, particularly for horses and ponies diagnosed with EMS/IR, is beneficial once the hoof capsule is stable, because exercise reduces blood insulin levels.

When the horse or pony has been completely sound for a month the use of a cereal-grain-free feed balancer, as a palatable and concentrated source of vitamins, minerals and yeast products, can be very helpful if too much condition has been lost. A good choice would be TopSpec Comprehensive Feed Balancer. In those cases where condition needs to be built significantly e.g. for showing, it is important not to rush the weight gain and to avoid high sugar and/or cereal-grain based feeds. A suitable source of additional calories would be TopSpec CoolCondition Cubes. Horses and ponies do not need to be obese to win in the show ring as the picture of a very successful pony broodmare (on p.1) demonstrates.

Can laminitis be prevented?
Most cases of laminitis that are predominantly triggered by excessive intake of sugar and starch can be prevented by following sensible management strategies, including adopting high-fibre but nutritious diets. The following points may help susceptible horses and ponies, even if they are genetically insulin resistant or suffer from EMS:

- Find the most suitable grazing you can. Unproductive grassland such as hill land is ideal, where ponies have to exercise a great deal to eat a moderate amount of average quality grass. Old meadow or parkland grazing is the next best. If you can arrange mixed grazing with sheep to keep the sward down that is hugely helpful and has the spin-off benefit of helping to control worms. Pasture sown with ‘Improved’ Italian Ryegrass may be ideal for high-yielding dairy cows but is the most likely to induce laminitis in susceptible horses and ponies as it is high in sugar.
- Limit access to lush pastures either by limiting turnout time or by fencing off small areas with e.g. an electric fence. Consider using a muzzle, but only for limited periods as they can cause immense frustration, and only use them under supervision.
- Never make rapid changes in the diet e.g. do not suddenly turn out onto good pasture. Introduce it gradually, even if

A Welsh pony fed correctly to avoid laminitis.
you are on a livery yard try to persuade the owner to let you move fields gradually rather than instantly. Similarly, make all changes to forage or hard feed gradually, over at least four days. The reason for this is that you are trying not to suddenly provide the microflora in your pony’s hind gut with a large amount of a different type of feed because this often results in upsetting the balance of the microflora, with both colic and laminitis possible consequences.

- Avoid fertilised and frozen pasture. Trying to turn out when sugar levels in grass are at their lowest is very difficult to achieve in the unpredictable British climate. You are trying to avoid total NSC levels, not just fructans (chains of sugar molecules called fructo-oligosaccharides). A broad generalisation is that sugar levels are at their lowest between midnight and dawn which is not hugely practical but some advantage may be gained by turning out after midnight or at first light providing you have brought your horse back in again by mid-morning at the latest. If the ambient temperature is below 5°C then avoid turnout even if it is not actually freezing.

- Avoid letting horses and ponies become obese. For showing, a well-furnished look with good topline can be achieved by feeding and working to build muscle with zero use of cereal-grain- based feeds. If necessary to control his weight, increase the amount of exercise you do with your horse or pony so that a 15hh horse for example never receives more than 1.5kg (dry weight) of ‘hard’ feed in any one meal. (The standard recommendation would be not to exceed 2kg/meal).

- Reduce the standard recommendations so that a 15hh horse for example never receives more than 1.5kg (dry weight) of ‘hard’ feed in any one meal. (The standard recommendation would be not to exceed 2kg/meal).

- If extra calories are needed to obtain correct condition maximise the use of high-fibre feeds e.g. unmolassed alfalfa such as TopChop Alfalfa, shredded beet pulp (discard the juice or use unmolassed), and cubes formulated without cereal grains e.g. TopSpec FibrePlus cubes or TopSpec CoolCondition Cubes.

- Avoid feeding high in sugar e.g. molassed coarse mixes and straw chops.

- Avoid feeds high in starch i.e. cereals or cereal-grain-based compound feeds.

- If necessary, use soya or linseed oil as a ‘safer’ calorie source than cereals or cereal-grain-based compound feeds. Oil is digested in the foregut and when fed at recommended levels will not upset the hindgut. High oil diets must be supplemented with anti-oxidants, principally vitamin E and selenium; these are included in high levels in all suitable TopSpec products.

- Where ‘hard’ feeds are needed provide them in small amounts i.e. little and often. Reduce the standard recommendations so that a 15hh horse for example never receives more than 1.5kg (dry weight) of ‘hard’ feed in any one meal. (The standard recommendation would be not to exceed 2kg/meal).

- Monitor the digital pulse daily to give you an early indication of imminent lameness. Feet that remain hot over 48 hours may also be a warning but short-term hot feet are not. Noting a loosening in droppings may also be helpful.

- Avoid unnecessary trauma to feet e.g. avoid stony, uneven ground and minimise trotting on roads. Do not jump on hard ground. Do not trim off excess hoof all at once.

- Bear in mind that although native ponies and ‘good-doers’ are most susceptible probably because of genetically inherited insulin resistance (if they have an IR phenotype their risk of laminitis is increased ten-fold), all types of horses and ponies can, and do, get laminitis.

The circumstances surrounding every case of laminitis are different and usually more than one cause is involved. The speed of recovery also varies. I would suggest therefore, that you consult an experienced nutritionist to help you adapt the generalisations I have given to meet the specific requirements of your horse or pony.

Suitable products for nutritional support:
I recommend TopSpec AntiLam (a pelleted multi-supplement) to provide nutritional support for horses and ponies during, being treated for, or recovering from a laminitic attack. It includes a broad-spectrum supplement, plus optimum levels of the nutrients needed to improve hoof quality, with generous levels of anti-oxidants to help maintain healthy tissues and yeast products to optimise the hindgut environment. It is formulated without cereal grains and consists of just all the micronutrients described, pelleted onto a high-fibre, very low calorie base to encourage consumption, but not weight gain.

TopChop Lite is an unmolassed alfalfa/straw blend chop which contains very little (less than 3%) sugar and starch. It is ideal to bulk up the feed, provide ‘nutritionally-known’ fibre and reduce boredom. It is an expensive, but highly successful, hay replacer.

TopSpec Comprehensive Feed Balancer, when used in conjunction with a sensible feeding programme such as TopChop Alfalfa and TopSpec CoolCondition Cubes, can be fed very successfully to underweight horses and ponies prone to laminitis, or to those which have recovered, as all the products are formulated without cereal grains and are very low in sugar and starch. They will help to build condition safely.

Conversely, if you have a good-doer or overweight horse or pony in light work, then TopSpec Lite Feed Balancer, accompanied by TopChop Lite if you wish, will not promote weight gain when used as part of a calorie-controlled diet.