A VET'S GUIDE TO **FEEDING THE LAMINITIC**

YOUR PRACTICAL MANUAL TO
SAFELY FEEDING LAMINITICS THROUGH
CRISIS, RECOVERY AND **IN THE LONG-TERM.**

WHAT WE WILL COVER...

- **A Quick & Easy Plan Of Action** For Feeding During the Acute Phase
- **Which Feeds & Forages Are Safe** & Which Ones To Avoid
- **The 4-Step Recovery Diet** That Meets All Nutrient Needs So Laminitics Can Get Sound Faster
- **Long Term Management To Support Health** & Prevent Relapses
- How FeedXL Can Help Your Clients **Balance Diets & Find Safe Feeds**

FeedXL has helped me greatly in providing nutritional advice to clients. With all the marketing hype and multitude of opinions out there, it can be difficult to decide what to feed, and this is why it is so invaluable to get an accurate and non-biased assessment of your horses' diet. Love it!!!"

DR HAYLEY JAENKE
FEEDXL MEMBER

CONTENTS

Hey there!

Laminitis is awful. Totally awful! The guilt a horse's owner feels about letting this happen to their horse. The pain the horse feels. The panic when the horse's owner can't find, or worse, doesn't even know where to start looking for safe feeds and forages. And the ongoing struggle of managing these horses long-term. It's all horrible.

I know only too well... because I've been there with my own horses. And I, of all people should know what to do to prevent laminitis. But that's the thing with this condition. It can happen when you least expect it. This was the case for me. Three horses. All with laminitis in the same week. Two with no prior history. In summer! What on earth?!

Luckily, for my horses, I did have the knowledge and the tools to get on top of it fast. So my horses recovered quickly and are now back to being fully sound (barefoot gravel crunching sound in one case) and able to handle full workloads. Plus they haven't had a relapse in more than four years!

However, I see far too many horses where this is not the outcome. Where the pain goes on for many months. Where the horse and the owner suffer through the ordeal. Where the horse has relapse after relapse. All too often the horse is euthanized because it was 'untreatable'. Leaving you, the veterinarian frustrated and feeling like you have failed the horse.

But in most cases, where all the right veterinary, farriery and nutrition care is taken, the horse can and will recover. As a veterinarian you know what to do. As science progresses, you have more tools in your kit for diagnosing, treating and managing these horses.

What I want to do in this e-book, is give you **a toolkit to manage the nutrition** of these horses. During the crisis phase, recovery and then long-term for prevention. So that the horse is not bouncing in and out of your care with progressively worse cases of laminitis. And so the owner is not taking up your time with endless questions about feeding.

Too often nutrition is like the elephant in the room with laminitis. We all know it is important, but often the path to the right nutrition for laminitics is not clear. Plus, it is clouded by marketing and inaccurate claims from feed and supplement companies and conflicting scientific information.

With the right know how, amazing things can be achieved. Here is my simple guide for managing nutrition during and after laminitis… so that more horses, and you, get the best possible outcome!

Truly hope it helps!

Team FeedXL

PHASE 1: CRISIS

Laminitis! What to do? If caught quickly, laminitis can be brought under control before it does any lasting damage to the hoof. Here is your plan of action for feeding and nutrition.

IN THIS CHAPTER WE WILL COVER:

CRISIS PHASE PLAN OF ACTION

This plan should be implemented by the horse or pony owner as soon as signs of laminitis appear; be it a bounding digital pulse or lameness.

01 REMOVE ACCESS TO ALL PASTURE

Pasture is often the cause of laminitis. During the 'Crisis Phase' it should be treated as guilty until proven innocent.

02 PUT THE HORSE ON A SAFE 'HAY ONLY' DIET

Choose the hay from the 'Safe Forages' list on page 7. Refer to the table on page 7 to determine how much hay should be fed per day in a slow feeder hay bag or net.

If the hay has not been tested and you do not know if it is less than 10% Non-Structural Carbohydrate (NSC), soak the hay (see 'Soaking Hay', page 11).

03 REMOVE ALL FEEDS & SUPPLEMENTS FROM THE DIET

The feeds and supplements being fed may be contributing to the laminitis but it is not always easy to identify the cause. The safest course of action is just to remove them all from the diet.

04 CONTINUE THE CRISIS DIET UNTIL THE LAMINITIS STABILISES

The role of the 'crisis diet' is to remove the cause of the laminitis from the diet to allow the horse's metabolism to stabilise. This should halt the insult to the hooves. The horse (or pony) should be kept on this diet until the laminitis stabilises and lameness starts to subside.

This diet is not anywhere close to a balanced diet that will support optimum health and healing. However it does serve a very important purpose. Being so plain in nature, it takes pressure off the horse or pony's system to deal with any new insults to the hoof.

SAFE FORAGES

TIMOTHY HAY

ORCHARDGRASS HAY

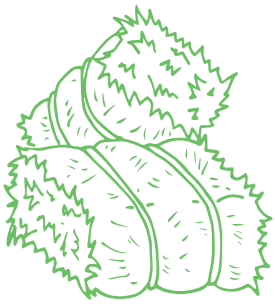
BERMUDAGRASS HAY

TEFF HAY

RHODES GRASS HAY

DIGIT GRASS HAY

& HAYLAGE MADE FROM ANY OF THESE GRASSES



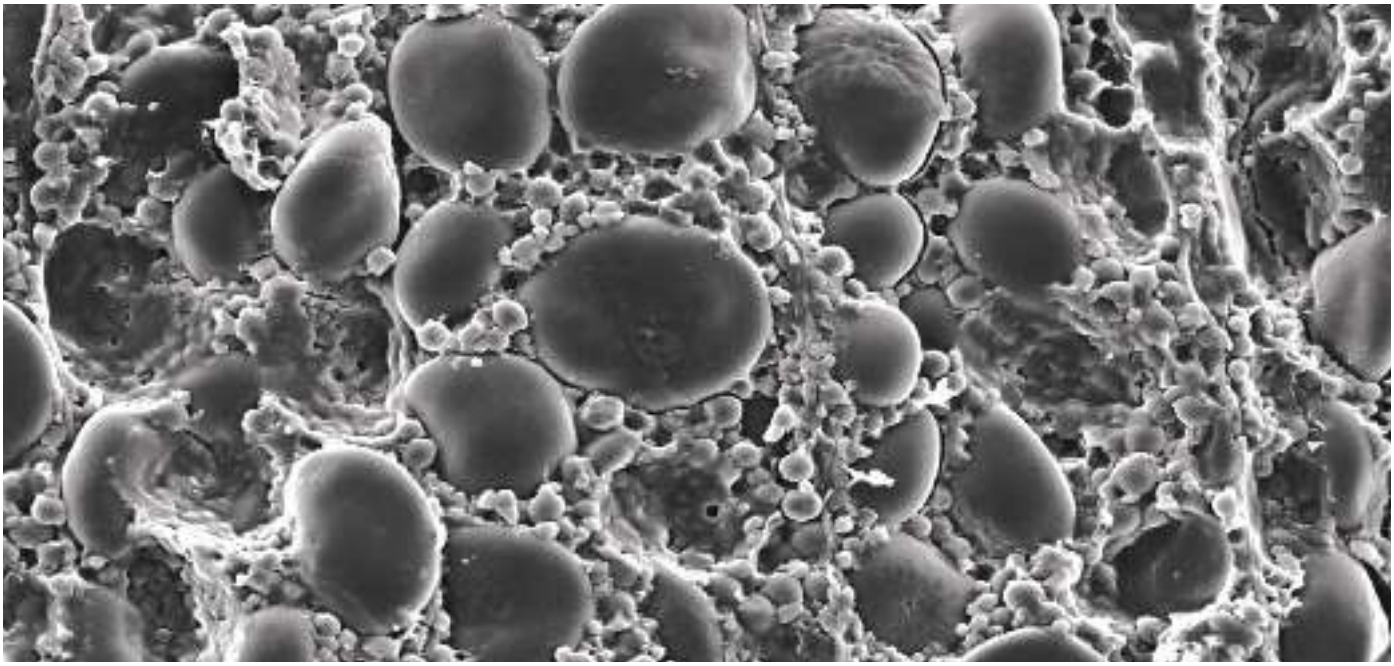
If no safe grass hay or haylage can be found, Alfalfa/Lucerne Hay or haylage can be used.

During the Acute Phase, **soak all hay before feeding unless it has been analyzed and is less than 10% NSC and low (<500 ppm) in nitrate** (see 'Soaking Hay', page 11)

BODYWEIGHT KG (LB)	HAY PER DAY KG (LB)
100 (220)	2 (4.4)
200 (440)	4 (8.8)
300 (660)	6 (13)
400 (880)	8 (17.5)
500 (1100)	10 (22)
600 (1300)	12 (26)
700 (1550)	14 (31)
800 (1750)	16 (35)

Above (top): A list of safe forages suitable for laminitic horses

Above (bottom): How much hay to feed per day during the 'Crisis Phase' depending on a horse or pony's bodyweight



Above: Closeup of barley starch

WHAT IS NSC?

(NON-STRUCTURAL CARBOHYDRATE)

Non-Structural Carbohydrate (NSC) = Starch + Water Soluble Carbohydrates. We use the NSC content of feeds, supplements and forages to determine if the ingredient is low enough in starch and water soluble carbohydrates to be safe to feed to a horse or pony who is prone to laminitis.

WHAT CAUSES LAMINITIS?

Most cases of laminitis you will see are due to some form of 'insulin dysregulation'. Insulin dysregulation is caused by conditions like Equine Metabolic Syndrome and PPID (Cushing's).

When horses and ponies with insulin dysregulation consume a feed ingredient that contains too much NSC, their post-feeding insulin level sky-rockets, and will be well above physiologically normal levels [1].

Research[2,3] has shown that it is these high levels of insulin that actually cause the damage to the lamellae and the inflammation we see during laminitis.

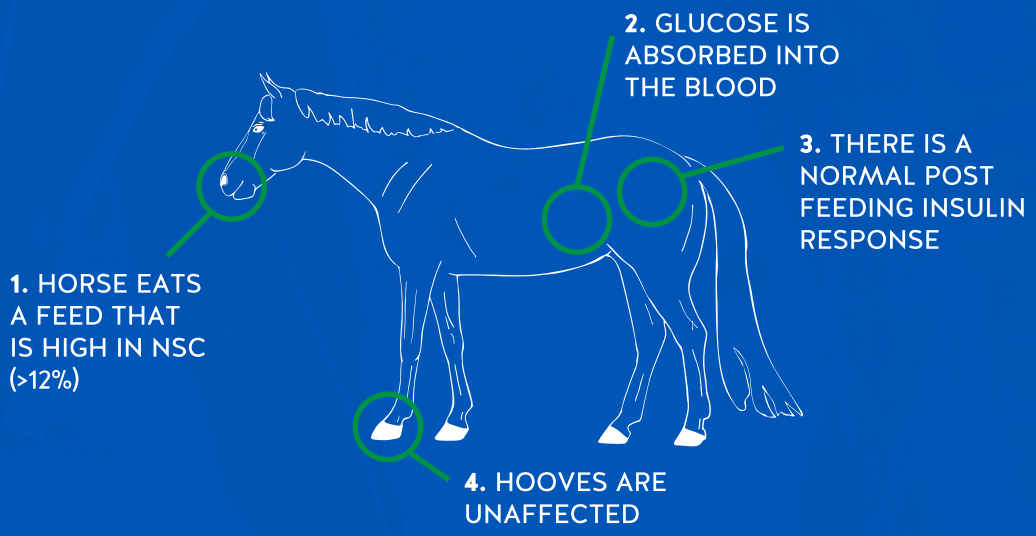
So the key to managing these horses nutritionally is to remove any high NSC feeds and forages that will spike post-feeding blood glucose and insulin levels.

HOW LOW SHOULD NSC BE IN THE DIET?

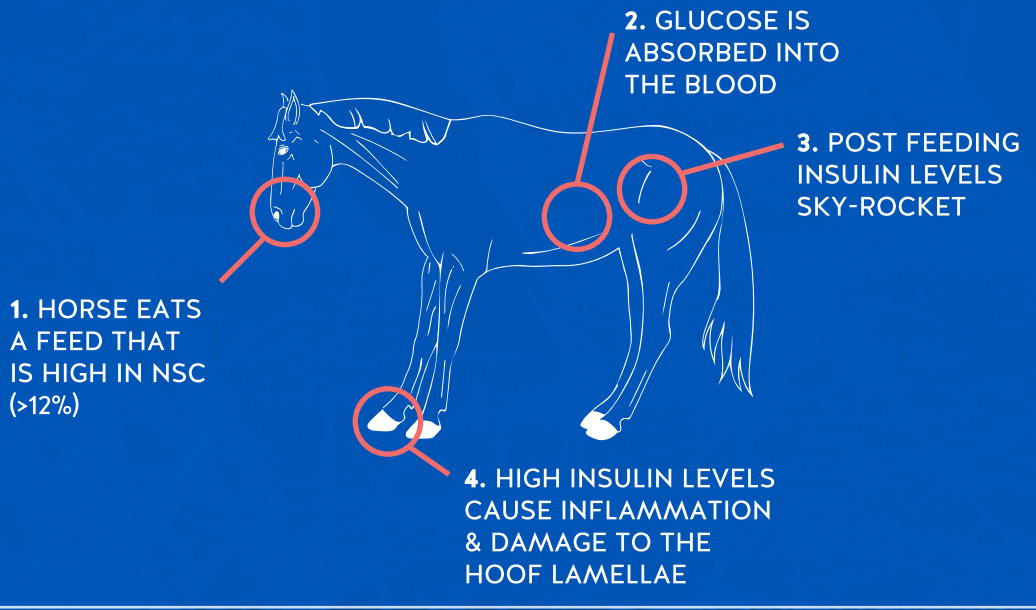
Current recommendations are to use feed ingredients with an **NSC level below 10%** for a horse during the acute and recovery phases.

Once a horse has recovered, feed ingredients with an NSC level below 12% should be used at all times. Very sensitive horses may need to remain on a diet with all individual ingredients below the 10% NSC threshold.

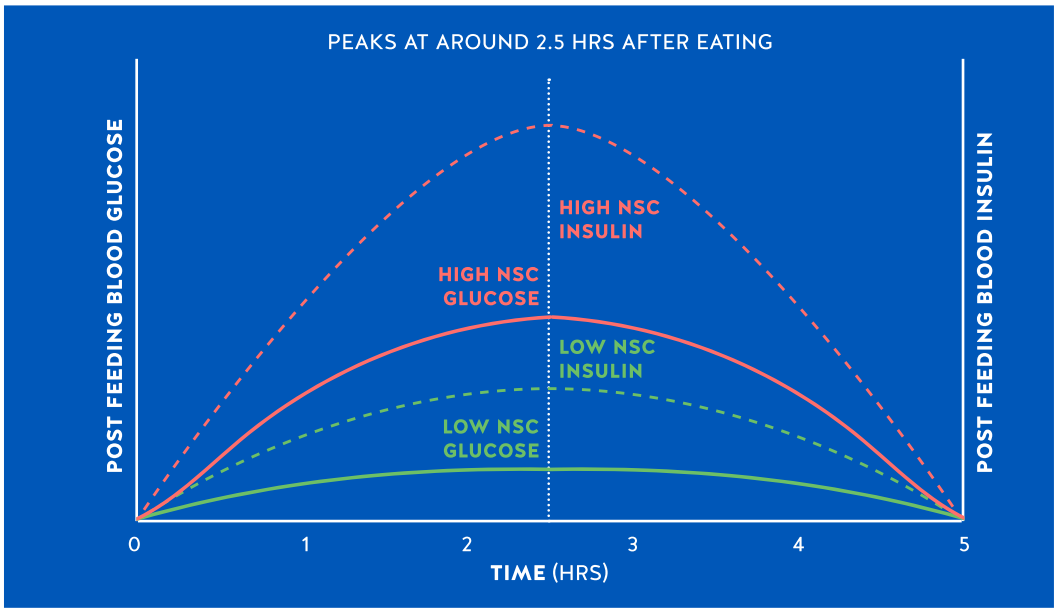
WHAT HAPPENS IN A **NORMAL HORSE** AFTER EATING A FEED THAT'S HIGH IN NSC



WHAT HAPPENS IN A HORSE WITH **INSULIN DYSREGULATION** AFTER EATING A FEED THAT'S TOO HIGH IN NSC



Above: Diagram showing what happens after consuming a feed high in NSC in a normal horse and a horse with insulin dysregulation



Above: A Graph depicting glucose and insulin responses in a normal horse after consuming low NSC (10%) and high NSC (18%) feed

WHY DO WE NEED LOW NSC FEEDS AND FORAGES?

Starch and sugars are digested and absorbed into the blood as glucose. Low NSC feeds are low in starch and sugars, so they will keep post feeding blood glucose levels low. And with low blood glucose, post feeding insulin levels also remain low.

With low circulating insulin levels, there is not enough insulin to insult the laminae. And no insulin-related laminitis!

BEING PREPARED

The most important thing when laminitis appears is to get whatever is insulting the horse's hoof out of the diet as quickly as possible. The horse owner may not know which feed ingredient is doing the damage. So by removing the horse from pasture and taking all feeds and supplements out of its diet, the offending feed ingredient(s) will be taken away.

HOWEVER, a horse owner can't do this unless they have safe hay that they can immediately place their horse on.

Anyone with a horse or pony prone to laminitis should have a minimum of one weeks supply of hay at hand that they know is safe (<10% NSC) or can be soaked to be made safe. That way, as soon as the horse or pony shows any sign of a digital pulse or lameness, it can be put immediately onto the safe, low NSC hay only 'Crisis Diet'.

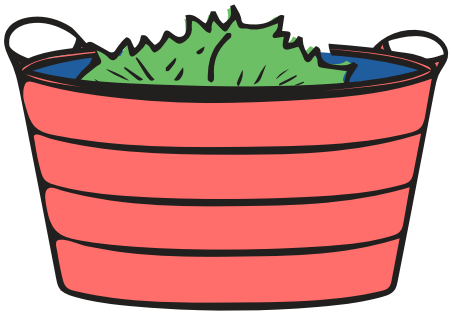
HOW TO **SOAK HAY**

STEP 1

SOAK FOR 2 - 10* HOURS IN COLD WATER

OR

SOAK FOR ½ - 2 HOURS IN WARM WATER



STEP 2

DRAIN, PLACE IN A SLOW FEEDER HAY BAG OR PILLOW, AND FEED.

* In warm climates, soaking for more than 2 hours is not recommended due to concerns around microbial growth on the soaked hay.

Above: Diagram showing how to safely soak hay to reduce sugars

TIP:

PUT A BRICK ON TOP OF THE HAY TO KEEP IT IMMERSED IN THE WATER.

NOTE:

DO NOT ALLOW THE HORSE OR PONY ACCESS TO THE SOAKING WATER AS IT COULD BE HIGH IN SUGARS. SOAKING WATER SHOULD NOT BE DISPOSED OF IN STORM WATER. WITH ITS SUGAR CONTENT IT MAKES A NICE PREBIOTIC FOR SOIL MICROBIOTA SO POUR IT ON A PASTURE OR GARDEN.

> *Long term, the 'lock it up & starve it' approach will delay healing, cause gastric ulcers and create other severe deficiencies*

DO NOT 'LOCK IT UP AND STARVE IT'

This was the old way of dealing with laminitic horses. And to some extent, in the short term, it may have appeared to work. In a starved state, excess insulin would not have been an issue and damage to the hoof likely ceased. So lameness may not have gotten worse.

BUT, long term, 'lock it up and starve it' will delay healing, cause gastric ulcers and create other severe deficiencies that will result in poor immune function, increased risk of hoof abscess and generally poor condition and health. It is not a solution for laminitis and will result in short term welfare issues and poor long-term outcomes.

CRISIS PHASE SUMMARY

1 INSULIN DYSREGULATION

Most laminitis you will see is caused by insulin dysregulation.

2 HIGH INSULIN LEVELS

Abnormally high levels of insulin cause insult to the hoof.

3 STOP FURTHER DAMAGE

To stop further damage, the feed ingredient(s) in the diet that are causing the increase in blood insulin must be removed.

4 HARD TO IDENTIFY

Sometimes it is not easy to identify what these ingredients are.

5 FOR BEST RESULTS

The best outcome will be achieved if you have the owner remove all feeds and supplements from the diet and take the horse off pasture.

6 LOW NSC HAY

Place the horse on low NSC (<10%) hay, chosen from the safe forages list.

7 SOAK HAY

If the NSC content of the hay is unknown, the hay should be soaked prior to feeding.

8 ONCE HE'S STABLE

Once the horse is stable, it can be moved slowly onto the recovery diet.

“Place the horse on low NSC (<10%) hay

PHASE 2: RECOVERY

Crisis averted! Now what?

When the cascade of laminitis starts, the horse's body seems to go on hyper-alert. It is far more sensitive to anything in the diet that may make laminitis worse. Taking him back to the very plain, safe or soaked grass hay only 'Crisis Diet' given in Phase 1, allows this hyper-sensitive state to pass. Once that occurs, we can then look at adding new ingredients to the diet to support healing, deal with inflammation and provide better outcomes for long term health.

IN THIS CHAPTER WE WILL COVER:

WHAT IS NEEDED IN THE DIET FOR RECOVERY?

During 'Recovery' where the horse needs to go from 'stable, but still lame' to 'sound', excellent nutrition is needed to support this recovery process. The grass hay used in the Crisis phase remains the base of the diet. But now we need to start adding in other nutrients that will support recovery.

Here are the main nutrients I want to start to introduce in a diet at this stage:

1. VITAMINS

Grass hay can be low in many crucial vitamins including vitamin E which is really important for dealing with the inflammatory state that exists during laminitis; and biotin, needed for hoof repair.

2. MINERALS

Hoof repair cannot occur unless there is adequate copper, zinc and calcium in the diet. Grass hays are typically low in copper and zinc and their calcium content is variable and often low. Plus, soaking hay will reduce mineral content. Correct supplementation of these minerals is needed to allow full recovery from laminitis.

3. ESSENTIAL AMINO ACIDS

Some of the most important nutrients the hooves need to repair are essential amino acids. Amino acids are the building blocks of protein and therefore the building blocks of the hoof. Different sources of protein contain varying levels of the essential amino acids (the ones that must be provided in the diet). So choice of ingredients is important to get the right levels of essential amino acids in the diet.

RECOVERY PHASE 4-STEP PLAN

The most critical thing to remember at this stage is to make ALL changes SLOWLY. Introduce new ingredients one at a time. And introduce everything slowly. Here are the steps for creating an effective recovery diet:

01

WORK OUT HOW MUCH HAY

Have the horse or pony's owner use FeedXL to determine an appropriate amount of a low NSC grass hay to be fed as the base of the diet. The amount that should be fed will depend on:

- Whether the horse or pony needs to gain, maintain or lose weight; and
- On the quality and calorie content of the hay (hopefully by now the owner will have a hay analysis that will give the Digestible Energy content for their specific hay which can then be uploaded into FeedXL).

Once an appropriate amount is determined, the hay should still be fed in a slow feeder hay bag or pillow.

02

FEED A LOW NSC BLANCER PELLET OR SUPPLEMENT

Introduce a low sugar, low starch balancer pellet (preferably less than 10% NSC; maximum of 12% NSC) OR a concentrated vitamin & mineral supplement that can meet all vitamin and mineral requirements. Introduce the chosen ingredient SLOWLY over a minimum of 14 days.

For balancer pellets, introduce at 50 grams (or 2 oz) per day, divided into 2 meals, and increase by 50 grams (or 2 oz) each day until you reach the required daily amount.

If a concentrated supplement is chosen it can be mixed into a small amount of soaked unmolassed sugarbeet pulp or alfalfa/ lucerne chaff for feeding.

The horse or pony should also be given access to free choice loose rock salt at this stage. Have the owner monitor the horse or pony closely to make sure no negative relapses occur.

03 FEED ALFALFA/LUCERNE HAY

Once the balancer/supplement is fully introduced into the diet, slowly introduce alfalfa/lucerne hay. Alfalfa brings protein with good levels of essential amino acids to the diet. And it brings variety, which is important to cover bases when it comes to providing nutrients like the essential amino acids we don't know a lot about. And it is also important to provide a variety of fibres to support gut microbiome diversity.

Alfalfa will help protect against gastric ulceration, which is a constant threat in laminitic horses and ponies on restricted diets (see page 20). And it is a valuable source of calcium. Suggested amounts for alfalfa/lucerne hay are given in the table below:

	HORSE NEEDS TO:		
	GAIN WEIGHT	MAINTAIN WEIGHT	LOSE WEIGHT
BODYWEIGHT	ALFALFA/LUCERNE HAY PER DAY		
KG (LB)	KG (LB)	KG (LB)	KG (LB)
100 (220)	0.8 (1.8)	0.4 (0.9)	0.2 (0.44)
200 (440)	1.6 (3.5)	0.8 (1.8)	0.4 (0.88)
300 (660)	2.4 (5.3)	1.2 (2.6)	0.6 (1.3)
400 (880)	3.2 (7.1)	1.6 (3.5)	0.8 (1.8)
500 (1100)	4 (8.8)	2 (4.4)	1 (2.2)
600 (1300)	4.8 (10.6)	2.4 (5.3)	1.2 (2.6)
700 (1550)	5.6 (12.3)	2.8 (6.2)	1.4 (3.1)
800 (1750)	6.4 (14.1)	3.2 (7.1)	1.6 (3.5)

Start by adding up to 200 g/day (½ lb/day) of alfalfa, (make this less for smaller ponies) and increase it by this amount every 2 to 4 days depending on the horse or pony, until you reach the desired daily amount.

04 BEET PULP FOR WEIGHTGAIN

If the horse needs to gain weight, add unmolassed sugarbeet pulp to the diet. Beet pulp is a good source of safe calories for laminitic horses. Where required, introduce beet pulp at 50 g (2 oz) per day and increase it by this amount every 2 to 4 days until the final required amount is reached.

Please note the amount of beet pulp that should be fed is dependent on the horse or pony and also the quality of the hay that is being fed. It is difficult to give recommendations here on the amount that should be fed. As a guide, horses that needs to gain weight can be fed up to 300 g of beet pulp (dry weight) per 100 kg of bodyweight (0.3 lb per 100 lb of bodyweight)

IMPORTANT: If beet pulp is fed during the recovery phase it should be soaked and rinsed 2 to 3 times prior to feeding.

> *Alfalfa brings a wealth of nutrients to a diet, like calcium & essential amino acids.*

FINDING THE RIGHT BALANCER OR SUPPLEMENT

With inaccurate and misleading marketing claims galore and poor label information, finding the right balancer pellet or vitamin & mineral supplement can be difficult and frustrating. With FeedXL though, it's easy. Here is how:

1. ENTER THE HORSE into FeedXL, tick 'Laminitis' in its list of conditions.

2. ENTER THE HAY BEING FED You can upload an analysis if there is one available.

3. CHECK THE RESULTS. You will see, with a hay only diet, LOTS of deficiencies.

4. CLICK 'FIND SUPPLEMENTS TO FIX THIS DIET' This will show you a list of supplements & an appropriate amount to feed to balance the horse's diet.

5. CHOOSE THE BALANCER PELLET OR SUPPLEMENT you want to feed from the list.

6. ADD IT TO THE DIET at the recommended feeding rate.

IS ALFALFA (LUCERNE) REALLY SAFE?

Yes! From a starch and sugar perspective, alfalfa is one of the safest forages you can use for a laminitic horse. You will rarely see alfalfa test above 10% NSC.

Alfalfa brings a wealth of nutrients to a diet, like calcium and essential amino acids, that are invaluable in supporting a laminitic horse through the recovery phase.

The problem with alfalfa is that it is high in calories. So for the overweight or obese laminitic, you need to be careful not to feed too much alfalfa, or you will potentially cause unwanted weight gain.

Be aware too, there is something about alfalfa that doesn't agree with a small number of laminitics. If you are not sure whether a particular horse or pony is OK on alfalfa, initially introduce it as soaked alfalfa. After two to three weeks if the laminitic is OK and has continued to improve with the alfalfa in the diet, gradually transition over to unsoaked alfalfa (to save the owner the time and hassle of soaking).

DIET FOR WEIGHT LOSS	**1.5 KG/100 KG BW** (1.5 LB/100 LB BW) LOW NSC OR SOAKED GRASS HAY **200 G/100 KG BW** (0.2 LB/100 LB BW) OF ALFALFA/LUCERNE HAY, CHAFF OR CUBES BALANCER PELLET OR VITAMIN & MINERAL SUPP. (DETERMINED BY FEEDXL)
DIET TO MAINTAIN WEIGHT	**2 KG/100 KG BW** (2 LB/100 LB BW) LOW NSC OR SOAKED GRASS HAY **400 G/100 KG BW** (0.4 LB/100 LB BW) OF ALFALFA/LUCERNE HAY, CHAFF OR CUBES **0 - 200 G/100 KG BW** (0 - 0.2 LB/100 LB BW) SUGARBEET PULP BALANCER PELLET OR VITAMIN & MINERAL SUPP. (DETERMINED BY FEEDXL)
DIET FOR WEIGHT GAIN	**2 KG/100 KG BW** (2 LB/100 LB BW) LOW NSC OR SOAKED GRASS HAY **800 G/100 KG BW** (0.8 LB/100 LB BW) OF ALFALFA/LUCERNE HAY, CHAFF OR CUBES **0 - 300 G/100 KG BW** (0 - 0.3 LB/100 LB BW) SUGARBEET PULP BALANCER PELLET OR VITAMIN & MINERAL SUPP. (DETERMINED BY FEEDXL)

Above: Basic guidelines for laminitis recovery diets

BEWARE OF ULCERS

Laminitis creates a perfect storm for gastric ulcers; stress, lengthy times off feed, NSAIDs and a restricted diet. Here are two tips to reduce the risk of gastric ulceration.

1. INCORPORATE ALFALFA INTO THE DIET.

Alfalfa has been shown to reduce the risk of ulcers. See the table on page 17 for suggested alfalfa amounts.

2. FEED ALL HAY FROM A SLOW FEEDER HAY NET OR HAY PILLOW.

One of the biggest risk factors for gastric ulcers is prolonged periods of time off feed. So the more you can slow hay intake down, the longer the time the horse or pony will spend eating and the shorter the periods of time off feed.

As a rule, try to avoid periods of longer than 4 hours 'off feed'.

RECOVERY DIETS MADE SIMPLE

While I really recommend putting diets together on a case by case basis using FeedXL, here are some guidelines (above) for hay and feed amounts, based on whether a horse needs to lose, maintain or gain weight

> *The majority of laminitis cases are caused by elevated post-feeding insulin levels, and not hindgut acidosis.*

WHAT ROLE DOES HINDGUT ACIDOSIS PLAY?

Good question! There is a lot of confusion about how hindgut acidosis is involved. Experimentally, severe hindgut acidosis has been used to induce laminitis in horses[4,5]. And for decades it was thought this was the primary cause of laminitis in horses.

However, with the research into insulin dysregulation, we now understand that a majority of laminitis cases are caused by elevated post-feeding insulin levels, and not hindgut acidosis.

Though the gut microbiota are possibly involved in at least partly determining insulin dynamics. This is an area that desperately needs further research!

RECOVERY PHASE **SUMMARY**

1 CRISIS PHASE DEFICIENCIES

The hay-only diet used in the 'Crisis Phase' will be deficient in many nutrients needed to support recovery.

2 RECOVERY DIETS TOP UP

The aim of the Recovery Phase is to bring all of these nutrients into the diet in a way that will not increase post-feeding insulin levels.

3 LOW NSC HAY IS THE BASE

The low NSC hay used in the crisis phase is used as the base of the diet during recovery.

4 BALANCER OR SUPPLEMENT

Diets should include a balancer pellet or supplement to meet vitamin and mineral requirements and alfalfa (lucerne) hay for essential amino acids.

5 BEET PULP FOR WEIGHTGAIN

Unmolassed sugarbeet pulp can be fed if a horse or pony needs to gain weight.

6 BEWARE OF ULCERS

Ulcers are a concern. Feeding alfalfa and using slow feeding hay systems to increase the amount of time a horse or pony spends eating will help.

7 FEEDXL TO BALANCE DIETS

FeedXL can be used by the owner to find 'safe' low NSC balancers or supplements and to balance the diet.

PHASE 3: LONG-TERM MANAGEMENT

Crisis averted, recovery successful! Now let's keep this equine sound and healthy and its owner happy.

IN THIS CHAPTER WE WILL COVER:

Long-term management diets will be essentially the same as the Recovery Diet, except the owner may choose to carefully allow the horse access to pasture. And the horse may go back into work, which will change the required nutrients needed in the diet.

And because these diets will be fed long-term, they must be PRACTICAL!

FEEDING FOR LONG TERM PREVENTION

The aim of feeding laminitis prone horses and ponies is to keep their blood glucose and therefore their blood insulin levels as low, and as stable as possible. So the trick is, to keep the diet as low in starch and water soluble carbohydrates (collectively known as NSC, see page 8) as possible.

Which sounds easy… BUT! There is a whole lot of misleading marketing telling owners that products are low in starch and therefore safe, when they are not. Aside from analysis, there is no easy way to tell whether a hay or pasture is actually low enough in NSC to be safe. And in the case of pasture, the NSC levels change within a day. And from day to day. So a pasture that is safe this week may not be safe next week… or even tomorrow.

Feeding these horses and ponies becomes a task that for many owners becomes overwhelming.

So let's keep things simple! We will start at the base of the diet and work our way up.

01 SAFE FORAGE

Forage should form the base of every horse's diet. Laminitics are no exception. Except that forage is often what brings a laminitic undone. The hay that was too high in NSC. Or the pasture that under certain conditions accumulated enough NSC to tip them over the edge. So forage, long term, for a laminitic, needs to be really carefully controlled. Hay is frequently needed as the forage base because pasture can be too unpredictable at certain times of the year.

Here are some tips for finding and feeding safe hay:

1. CHOOSE HAYS FROM THE SAFE FORAGES LIST (See page 7).

2. HAVE ALL HAY TESTED BY EQUI-ANALYTICAL FOR STARCH AND WATER SOLUBLE CARBOHYDRATE to determine total NSC content. Use the Carb Pack or the Equine Complete analysis package. (https://equi-analytical.com/)

3. HAY WITH LESS THAN 12% NSC ON A DRY MATTER BASIS CAN BE FED UNSOAKED*

4. IF HAY WITH LESS THAN 12% NSC IS NOT AVAILABLE, HAY SHOULD BE SOAKED to lower water soluble carbohydrate content enough to make the hay safe to feed. (See page 11).

5. OWNERS OF LAMINITICS SHOULD BE ENCOURAGED TO BUY LARGE QUANTITIES OF HAY THEY KNOW IS SAFE.

** Very sensitive horses and ponies should be kept on a forage with less than 10% NSC.*

IS PASTURE SAFE?

Pasture is tough to gauge for safety! Some pastures are safe almost all of the time. Some are rarely ever safe. And some are safe only some of the time or at certain times of the day. Problem is, you can't LOOK at pasture and know if it is safe or not. And currently there is no rapid field test to determine 'safety' either.

Whether it is green, brown, growing, dormant, spring, summer, winter or fall… pasture can be safe. Or it can be unsafe. There is no hard and fast rule to say it will be one or the other. So essentially with pasture we never really know if it is safe to allow grazing or not. And our laminitics almost become like the canary in the coal mine, constantly testing it for us and showing us if it is safe or not! Less than ideal!

You can analyse a pasture, but of course in the time it takes to get the analysis results back, the pasture can and probably will have changed NSC content.

To be considered 'safe' a pasture should be less than 12% NSC on a dry matter basis (less than 10% for very sensitive horses). Here are some very broad guidelines dividing pastures into parameters that make them 'often safe', 'maybe unsafe' and 'often unsafe'. First though, let me explain why each parameter is important:

GRASS SPECIES

The species of grass will determine how much NSC it can physically accumulate. C4 Type (subtropical grasses) have certain storage spots for their NSCs. Once these spots are full, they stop producing NSC. Which means typically they are usually safe for laminitics as they don't often accumulate above 12% NSC on a dry matter basis.

C3 Type Grasses (temperate grasses) on the other hand are able to make NSC and store it almost anywhere they can fit it. Which means under certain conditions they can be over 30% NSC on a dry matter basis. Some of these grasses (like ryegrass) have been specifically bred for the dairy industry, to have this ability to accumulate large amounts of NSC. So some C3 type grasses are worse than others.

Native/unimproved grasses often don't have a natural tendency to accumulate NSC, so these grasses also typically have quite low levels of NSC.

> *"To be considered 'safe' a pasture should have NSC less than*
>
> ***12%***

> *Grasses use the process of photosynthesis to make NSC as their source of food.*

CLIMATE

Grasses use the process of photosynthesis to make NSC as their source of food. Which is clever when you think about it! The plant then uses this NSC 'food' to fuel their own growth. Plants need certain conditions, and specifically warm enough temperatures, to allow them to grow.

Sometimes though, we get into climate patterns where NSC production is high (long 12+ daylight hours to give plenty of sun to drive photosynthesis). BUT the ambient temperature is too cold to allow the plant to grow. So the plant can make lots of NSC, it just can't use it for growth because it is too cold. Which means the NSC can start to accumulate, especially in C3 grasses.

WATER

Water has a similar effect to temperature. If water starts to become limited, plant growth is slowed, which can have two effects. First is a stressed plant might 'panic' and start to store higher levels of NSC in case it needs a reserve to get it through a dry period. And second, growth is limited, which means accumulated NSC will stay in the plant. So even drought affected pasture can be too high in NSC to be safe.

SOIL NUTRIENT STATUS

This is potentially one of the biggest issues for laminitics. Pasture growing in soil that has a limiting nutrient will be fully capable of photosynthesis and NSC production. BUT, if a nutrient is limiting growth, the NSC won't be able to be used to drive growth. It will accumulate instead (see Lessons learnt the hard way! Page 29), forcing pasture to accumulate unsafe levels of NSC, even when ambient temperature and soil moisture are perfect for growing!

USE THE TABLE BELOW TO HELP OWNERS ASSIGN GREEN, ORANGE OR RED PARAMETERS TO THEIR SPECIFIC PASTURE.

If the pasture is 'all green', they should be safe to allow at least some grazing (keep reading for when it is safest to allow grazing).

If a pasture has one or more 'orange' ticks, the sensitivity of the horse should be considered before allowing grazing and grazing may need to be restricted using a grazing muzzle.

A 'red' tick may mean it is safer to keep laminitis prone horses and ponies off this pasture.

	OFTEN SAFE	MAYBE UNSAFE	OFTEN UNSAFE
GRASS SPECIES	Subtropical (C4) Type grasses e.g. bermudagrass (couch), kikuyu, Rhodes grass, digit grass, pangola grass and native grass species. ☐	Native and C3 type grasses that have not been bred specifically to have high starch, fructans or sugars (e.g. Timothy, phalaris, orchardgrass (cocksfoot) and native grass species) ☐	C3 type grasses that have been bred specifically to accumulate high levels of starch, fructans or sugars (e.g. ryegrass and oats) ☐
CLIMATE	Warm, ideal growing temperatures. Plus warm overnight temperatures. Cloudy, wet weather is helpful in keeping NSC low. No cold or sub zero temperatures. ☐	Longer days with cool overnight temperatures, temperatures that sometimes dip below the temperature at which the pasture won't/can't grow. ☐	Longer days with cold overnight temperatures (typical of spring). Freezing overnight temperatures plus bright sunny days (typical of winter) ☐
WATER	Pastures are well watered either through natural rainfall or irrigation. ☐	Mild water stress. ☐	Moderate to severe water stress. ☐
SOIL NUTRIENT STATUS	Soils are well managed and essential nutrients for plant growth are provided. ☐	One or more soil nutrients start to limit plant growth. ☐	Severe soil deficiency of one or more essential nutrients that limits plant growth. ☐

Above: Table to help owners ascertain if their pasture is currently likely to be 'safe' for their horse to graze.

ALLOW GRAZING IN THE VERY EARLY MORNING!

Non-structural carbohydrates are the carbohydrates the plant produces during the process of photosynthesis. During photosynthesis, a plant takes sunlight for energy and uses water and carbon dioxide to create carbohydrates like starch, sugars and fructan.

NSC production starts when the sun comes up and finishes for the day when the sun goes down again. So during sunlight hours, a plant will produce NSC. Then overnight, the plant burns some of this accumulated NSC to survive and grow. They essentially make their own food during the day, and then 'eat' some of this food overnight to stay alive and grow.

Which means, NSC content will be lowest in the very early morning, just before the sun comes up. And they will be highest late in the afternoon, just as the sun goes down and into the early evening.

Advise owners to allow laminitics to graze only in the **VERY early hours of the morning.** And if the pasture may become unsafe, to have them off pasture within 2 hours of sunrise.

BE WARNED however, that even in the very early morning, some pastures will still be too high in NSC to be safe. Spring is a particularly risky time for this to occur as the days are long enough for high NSC accumulation, but the nights are cold enough to slow plant metabolism and growth down so much that they don't burn up much NSC overnight.

So early morning grazing is sometimes - but not always - safe!

UNSAFE FORAGES TO AVOID

1. OATEN HAY, CUBES OR CHAFF
2. WHEATEN HAY, CUBES OR CHAFF
3. BARLEY HAY, CUBES OR CHAFF
4. RYEGRASS HAY, CUBES OR CHAFF

Above: A list of forages to avoid when feeding horses prone to laminitis

UNSAFE FORAGES

We gave you a list of safe forages. Now here is the list of forages (above) that should ALWAYS be avoided. Even when soaked, they are likely to still be unsafe.

GRAZING MUZZLES

Grazing muzzles restrict pasture intake by upwards of 80% and are a very useful 'tool' to help manage horses and ponies prone to laminitis. Grazing muzzles can be used on very sensitive horses and ponies to really limit intake of pasture during early morning grazing sessions. They can be used during periods when pasture is expected to be too high in NSC to restrict pasture intake during these periods.

Or they can be used to simply restrict pasture and therefore calorie intake in overweight horses to help control body condition. Horses and ponies are very accepting of well fitted grazing muzzles. They help to recreate natural feeding behaviours. And they help owners to feel 'better' as they are able to let their horse or pony graze and have some freedom and access to pasture.

LESSONS LEARNT THE HARD WAY!

In December 2014 we purchased a new property. In summer the following year, all three of my horses had laminitis. What I hadn't figured out yet was that our soil was severely deficient in sulfur. Plants need sulfur to make protein. Without it, their growth is restricted.

But my grasses were green. They had water. And continued to photosynthesise. So I had a pasture full of grasses that could make carbohydrates, but they couldn't grow due to the lack of sulfur. Which meant the carbohydrates were just accumulating. Pasture tests revealed that on sunrise, my pasture NSC level was 8%. At sunset, on the same day, this had increased to 19.3% dry matter! And there was my trigger for the laminitis!


“
To know if a feed or supplement is safe, read the label and look for a starch and WSC value.

SAFE FEEDS

UNMOLASSED SUGARBEET PULP (preferably soaked and rinsed twice)

SOYBEAN HULLS

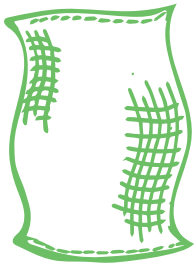
LUPINS & LUPIN HULLS

FLAX/LINSEED

COPRA MEAL

SUNFLOWER SEEDS

ALFALFA/ LUCERNE MEAL

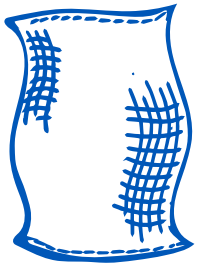


SAFE FEEDS IN SMALL AMOUNTS

SOYBEAN MEAL

FULL FAT SOYBEAN

HIGH OMEGA 3 OILS



UNSAFE FEEDS

GRAIN
(All grains including oats, corn/maize, barley, rice, rye, triticale, sorghum)

GRAIN BYPRODUCTS
(ricebran, wheat middlings, wheat bran, pollard or any variation on these products)

FEEDS CONTAINING GRAIN OR GRAIN BY-PRODUCTS
unless they have a guaranteed NSC content of less than 12%

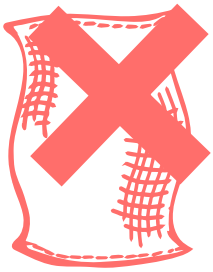
MOLASSES

SUGARS (glucose, dextrose, sucrose)

PEAS

FIELD OR FABA BEANS

CHICK PEAS



Above: A guide to which feeds are safe, safe in small amounts and unsafe

02

FORAGE SORTED... NOW WHICH FEED INGREDIENTS ARE SAFE?

With a safe base of forage, laminitics will still need additional supplements, balancers or feeds to top up nutrients that are not fully supplied by their forage. When feeding to prevent or control lamintis, ingredient choice revolves around choosing ingredients that will not spike post-feeding blood glucose and insulin levels.

Research and practical field experience have shown that forages, feeds and supplements containing less than 12% Non-Structural Carbohydrate (NSC; NSC = Starch + Water Soluble Carbohydrates) should be chosen for horses prone to laminitis. With feed ingredients less than 10% NSC recommended for very sensitive horses and ponies.

To know if a feed or supplement is safe, read the label and look for a starch and water soluble carbohydrate (WSC) value. When you add these two together they should be less than 12%. If starch, WSC and/or NSC values are not available on the label, you should contact the manufacturer to ask for this information.

To help you out, refer to the list of safe and unsafe feed ingredients above.

Above: In FeedXL you can see which ingredients are safe and unsafe for horses laminitis

BEWARE OF CLAIMS

Unfortunately many feeds and supplements will claim they are 'Laminitis Safe'. Some are even 'registered' by groups like the Laminitis Trust as being Safe. But NEVER trust these claims without properly reading the label. Here is what to look for on a label to determine if a feed actually is safe!

A starch and water soluble carbohydrate (WSC) value. Added together, these should be less than 10 - 12%.

If this is not available, read the full listing of ingredients and make sure the feed contains none of the 'Unsafe' ingredients listed on page 31. If none are listed, the feed may be safe. But it would still be best to check with the manufacturer for a starch + water soluble carbohydrate (WSC) value.

If any of the unsafe ingredients are listed, and the feed does not specify starch + water soluble carbohydrates (WSCs), do not use this feed. Even if it claims it is 'safe'.

FEEDXL MAKES FINDING SAFE INGREDIENTS EASY!

To save the time and uncertainty for you or your clients in finding 'safe' feeds for laminitics, we classify all feeds, forages and supplements as safe or unsafe. Classifications are based on what we know or do not know about a feed ingredients starch and water soluble carbohydrate content.

When a horse is entered as being prone to laminitis, you will see the feed ingredient listing shown as safe (black) or unsafe (red). This simple classification will save you and your clients hours of time. And it will put a stop to years of heartache caused by using feeds an owner thought was appropriate!

03 BALANCING THE DIET

A balanced diet, for any equine, is the foundation of good health. But it becomes even more important for a horse or pony prone to laminitis. A diet that meets all requirements for macro and trace minerals, vitamins and essential amino acids will give these animals the best possible chance of maintaining as near to normal metabolism and hoof health as possible.

And it should also mean they can return to, and remain healthy, in normal levels of work. Work will help with maintaining a healthy body weight and may even give benefits through improved insulin sensitivity.

FeedXL is essential at this stage of nutrition management.

WITH FEEDXL, A HORSE OR PONY'S OWNER CAN:

1. DESIGN A BALANCED DIET that meets all requirements for protein, amino acids, minerals and vitamins.

2. MANAGE CALORIE INTAKE to avoid excess weight gain.

3. CREATE A CALORIE RESTRICTED DIET that does not create other nutrient deficiencies that will compromise health.

4. PREVENT NUTRIENT DEFICIENCY.

5. AVOID UNSAFE FEEDS, FORAGES AND SUPPLEMENTS that are too high in NSC.

6. ADAPT THE DIET according to the workload or stage of reproduction for any horse.

04 EXERCISE

Exercise is a crucial part of the long term management of laminitis prone equines. Exercise helps to keep the overweight horse or pony at an appropriate body condition. But it has also been shown in equines to reduce inflammation and improve insulin sensitivity[6].

In their 2019 ECEIM consensus statement on equine metabolic syndrome, Durham et al[7] suggest the following as an exercise program for horses who have experienced laminitis but now have recovered and have stable hoof lamellae:

Minimum exercise recommendations are low-intensity exercise on a soft surface (fast trot to canter unridden; or HRs 110-150 bpm) for >30 minutes, >3 times per week, while carefully monitoring for signs of lameness.

And for horses with Equine Metabolic Syndrome who experience insulin dysregulation and are at risk of developing laminitis, the following is recommended:

Low-to moderate-intensity exercise (canter to fast canter, ridden or unridden; or HRs 130-170 bpm) for >30 minutes, >5 times per week.

My personal experience supports that when in work, horses are easier to keep at an ideal weight and they seem less prone to laminitis. My post-laminitis horses are fully sound and able to work over long distances, under saddle, even on hard surfaces.

While not all post-laminitis cases will be able to work to this level, owners shouldn't be told that their horse will not be able to undergo full workloads just because it has had a bout of laminitis. The level of work a horse or pony can handle needs to be determined on a case by case basis, in consultation with you as their veterinarian.

05 ENDOCRINE MONITORING & PHARMACOLOGIC AIDS

While outside the scope of this e-book, testing horses and ponies to determine the cause of laminitis may help to define the most appropriate approach to long-term management, especially where PPID is involved. And continued monitoring may help owners in determining if specific horses can be allowed access to pasture or to know if the weight loss and exercise program is helping in improving insulin dynamics. There are also various medications that can be used to assist in managing laminitics. For a recent review of both topics, please refer to the ECEIM consensus statement on equine metabolic syndrome by Durham et al (2019)[7].

LONG TERM MANAGEMENT **SUMMARY**

1 **CONSISTENTLY LOW NSC**

Feeding laminitics long term revolves around consistently keeping their diet low in NSC.

2 **PASTURE CAN BE TRICKY**

Pasture presents particular difficulties as its NSC content can vary so dramatically.

3 **AVOID EXCESS NSC**

Grazing must be carefully controlled to avoid excess intake of NSC

4 **BALANCE THE DIET**

Careful balancing of the diet so it meets protein, amino acid, vitamin and mineral requirements will achieve better long term health outcomes.

5 **CHOOSE WISELY**

Feeds ingredients and balancers or supplements must be carefully chosen to avoid any high NSC products.

6 **BEWARE OF FALSE CLAIMS**

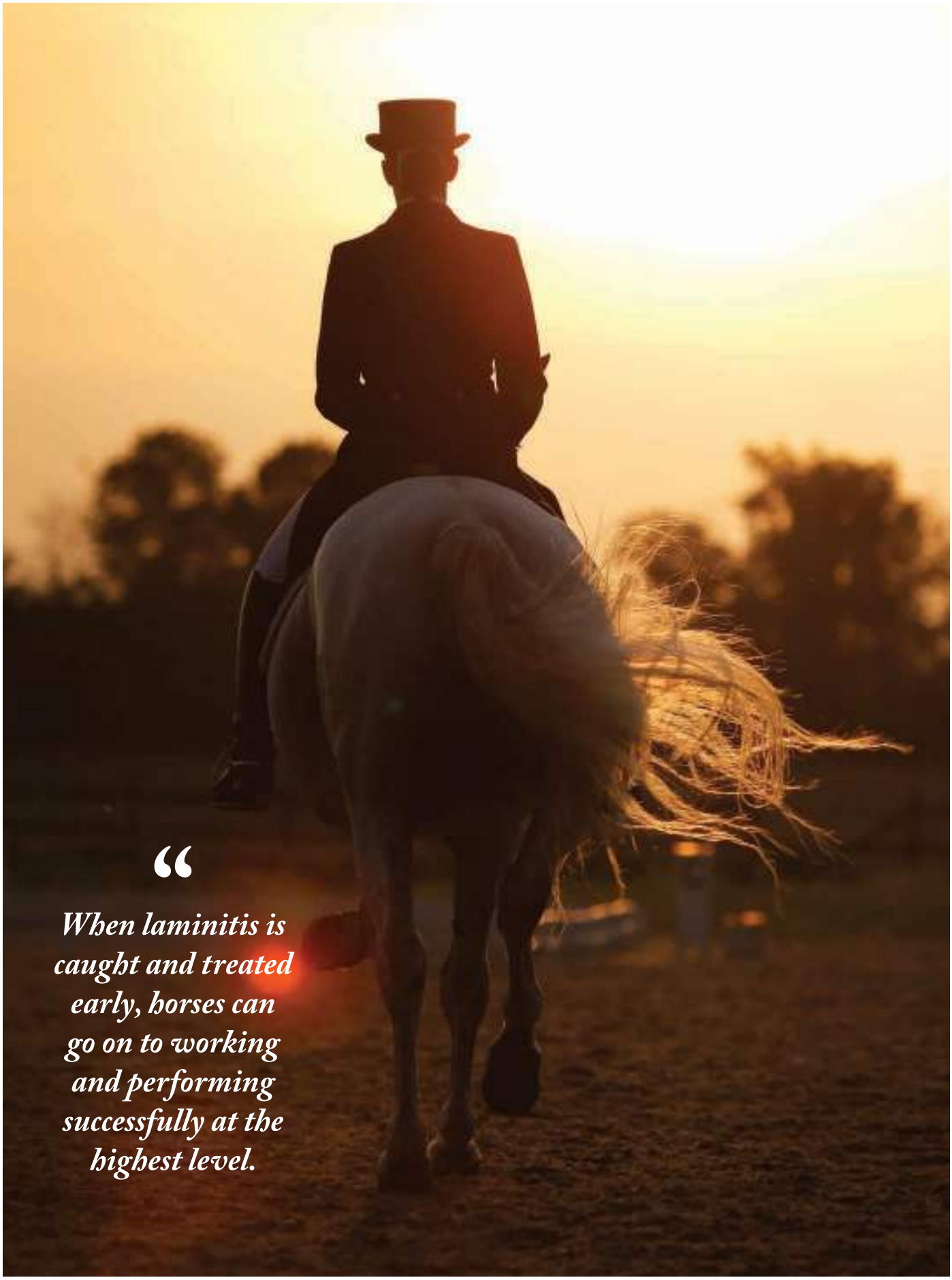
Misleading marketing claims and incomplete label information often makes choosing safe feed ingredients difficult.

7 **FEEDXL MAKES IT EASY**

FeedXL is recommended to assist owners in choosing safe, low NSC feed ingredients; and for balancing the diet.

8 **WE'RE HERE TO HELP**

FeedXL's team of specialist equine nutritionists are also available to help guide owners through this process.


“
When laminitis is caught and treated early, horses can go on to working and performing successfully at the highest level.

EMBRACE CHANGE FOR BETTER OUTCOMES

There is probably no area of nutrition that has changed more in the last two decades than in our understanding of what causes most cases of laminitis.

And with this better understanding of the cause, comes a more concrete understanding of how laminitics should be fed during crisis and recovery and then on into long-term prevention.

While there is still much we don't know, and research continues, we do understand enough to know that keeping these horses on well balanced, low NSC diets is a huge part of what will keep them sound and well. It is my hope that the information here can help 'catch you up' on what we do know and give you a simple but very effective plan to move forward in the feeding and nutrition of your laminitic patients.

Experience tells us that with the right veterinary care, farriery and nutrition laminitics can recover. And, when laminitis is caught and treated early, these horses can go on to working and performing successfully at the highest level. Please use the guidelines given here to keep nutrition simple, yet effective at all stages for these horses and ponies. And remember we are here at FeedXL to help your clients (and you) whenever needed!

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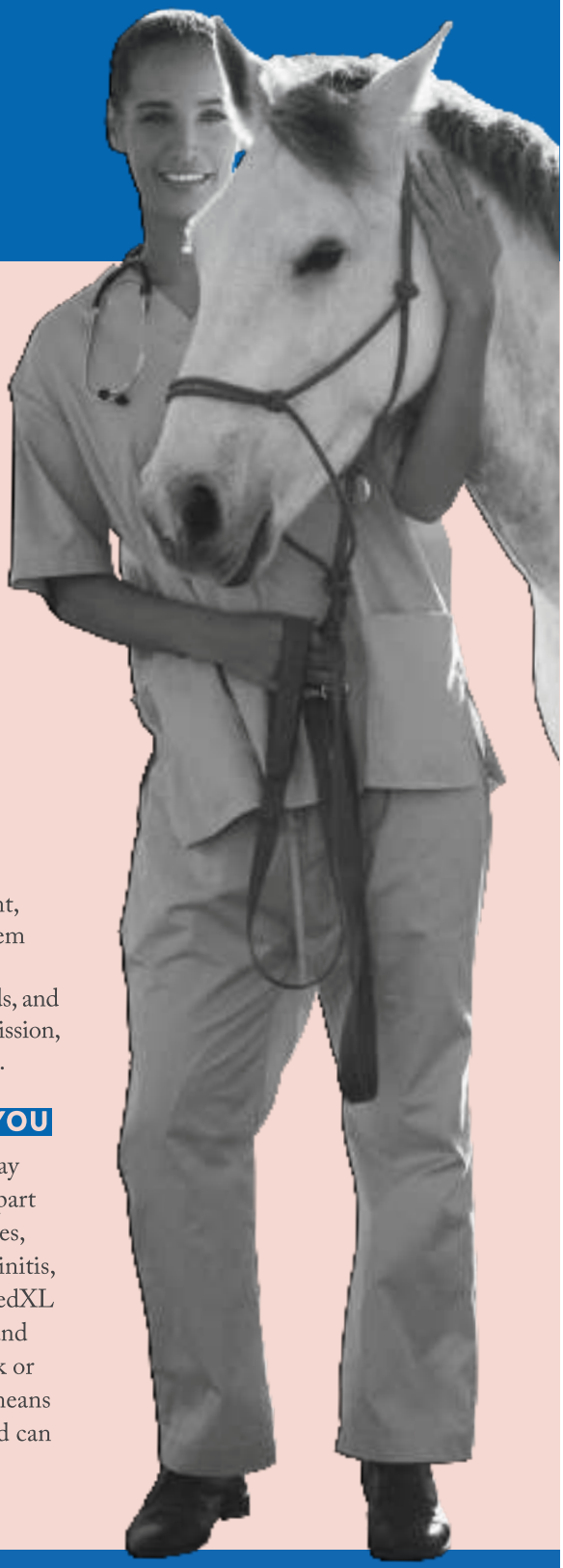
WHEN CLIENTS ASK YOU
'WHAT SHOULD I FEED MY HORSE?'...

BE PART OF
THE CHANGE

DO YOU WISH THERE WAS JUST 1 EASY ANSWER?



THERE IS... FEEDXL
THE ONLINE HORSE NUTRITION CALCULATOR

THIS IS HOW to free yourself from the headache, heartache, (and time you can't bill for) advising clients on what to feed their horse.

As a horse vet you're an expert in so many fields – surgery, medicine, dentistry, repro, orthopaedics – it's quite a list. Nutrition matters too, especially in helping keep the horses you've mended, stay well. But giving horse-specific feed advice is time consuming, frustrating and not the best use of your specialized skillset. Suggesting your clients look to FeedXL is smarter because:

IT TAKES A NIGGLY JOB RIGHT OFF YOUR LIST

FeedXL is easy to use. So your clients can tailor horse diets by themselves, without quizzing you. (And our nutrition support team can help out if they do get stuck.)

YOU CAN TRUST IT

Your business thrives because you're an expert. You genuinely care about keeping horses healthy. And clients trust your advice. Same goes for us.

Created and supported by a Specialist Equine PhD Nutritionist, FeedXL is 100% scientific and totally unbiased (we're not affiliated with any feed company, anywhere). So you can have total faith in it providing safe, accurate results for your clients.

IT SAVES YOUR CLIENTS MONEY

(& makes you a few dollars too)

Horse owners often over-supplement, which costs them. FeedXL helps them easily work out what feeds and supplements their horse actually needs, and what can go. You also get 10% commission, for every client you refer to FeedXL.

JOB SATISFACTION FOR YOU

You want the horses you mend to stay well. Good nutrition is an essential part of aftercare and helps prevent relapses, especially where conditions like laminitis, tying up and PPID are involved. FeedXL ensures clients know exactly what (and what not) to feed with no guesswork or barnyard hearsay involved. Which means your horsey patients are fed well, and can stay well. And this is satisfying.

FeedXL
Nutrition Makes a Difference


BE PART OF
THE CHANGE
FeedXL
Nutrition Makes a Difference
JOIN OUR
VET REFERRAL
PROGRAM
AND EARN
10% COMMISSION
FOR EVERY PLAN
YOUR CLIENTS BUY
Join us, and be a part of feeding horses Better. Smarter. Safer.
Be a part of FeedXL.
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