Forage – its value and its limitations in Equine Nutrition

Liz Bulbrook BSc (Hons)

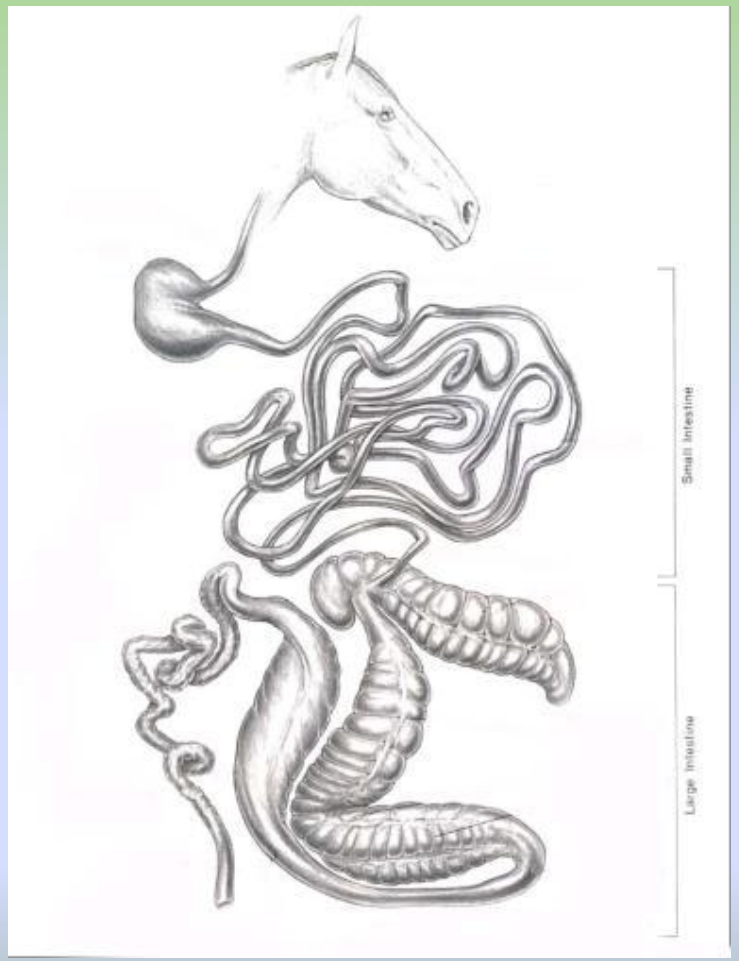
Director of Nutrition

Baileys Horse Feeds .

Tonight's Menu

- Why is forage so vital to the horse?
- Feed value of forage and factors affecting nutrient availability.
- What's often lacking – mineral deficiencies.
- Solutions to create a balanced diet for the "normal" horse & clinical cases.

The horse's digestive system



- Herbivores by design.
- Foragers by nature – trickle feeding.
- Can graze for up to 18 hours a day .
- Hind gut fermenters.
- Small intestine – relatively rapid rate of passage, enzymatic rather than fermentation.

Importance of Forage in the Horse's Diet

- Maintain Normal/Healthy Gut Function
  - During chewing, saliva is produced
    - The best buffer to stabilize intestinal pH
    - Insufficient fibre leads to increased incidence of ulcers, colic and RER cases. Minimum fibre for gut health not provided.
- Free Choice Hay or access to pasture reduces boredom and vices - Especially in Stress Situations

Well cared for pasture is the most inexpensive and nutritious form of forage.

Grass Pasture

- Perennial ryegrass, rough meadow grass, cocksfoot, timothy, fescues herbs and white clover <5%
- Ryegrass / fescue mixes increase pasture persistance, preferred for sown mixtures.
- Typically see low Mg in spring pastures, K & P vary according to degree of fertilisation.
- High Mo (5-10ppm), low Cu in regions of UK and Ireland.

Pasture values

- Primary concern for stud horses where significant part of mare and youngstock dietary regime.

- Performance horses may receive 6-8 hours on moderate to poor pasture – used more for exercise / down time than feed value.

- Pasture is a large part of pony diets yet generally limited feed value, except in spring, when grazing limited due to laminitis risks.

Grass hay

- Meadow hay (mixture of perennial ryegrasses, rough meadow grass and fescue.-
- Seed mixtures (specially sown as timothy / ryegrass blends
- Alfalfa / Timothy mixes (generally imported from USA / Canada as 40:60 ratio mixtures – only seen in racing yards due to expense!

The Nutritional Value of Forage

High

Å Soft

Å Leafy

Å Harvested Early

Low

Å Coarse

Å Stalky

Å Harvested Late

Maturity of the plant affects:

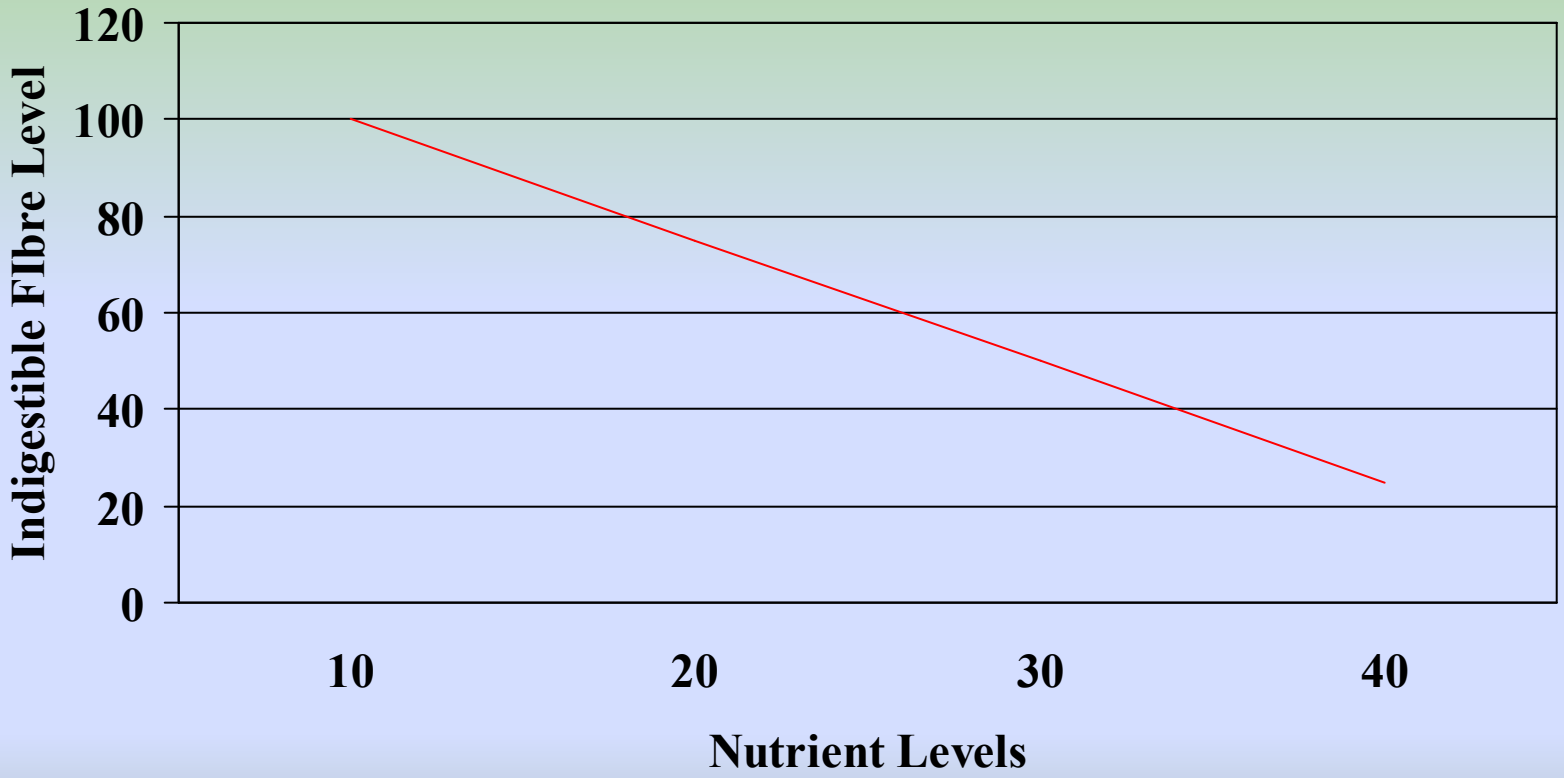
Å Palatability

Å Digestibility of the fiber

Å Amount and availability of the:

1) protein
2) calories
3) major minerals
4) trace minerals
5) vitamins

The relationship between indigestible fibre and nutrient levels



Typical forage figures in UK / Ireland.

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(DM basis)

Ingredients	Grass Hay Analysis	Grass Haylage Analysis	Grass Pasture Forage Analysis
Dry Matter	84.00-88.00%	48.00-65.00%	18.0 -25.00%
Protein	4.00-12.00%	5.00 -12.00%	12.0 -24.00%
Lysine	0.1-0.3%	0.125 -0.3%	0.3 ï 0.6%
DE (Mj/kg)	7.50 - 9.5	8.00 ï 10.0	8.5 ï 11.0
ADF	45.00-35.00%	45.00-30.00%	35.00 -20.00%
Calcium	0.25-0.80%	0.25-0.85%	0.40 -1.0%
Phosphorus	0.15-0.40%	0.15-0.45%	0.30 -0.5%
Potassium	0.80-1.50%	0.80-2.00%	2.00 -4.0%
Magnesium	0.10-0.25%	0.10-0.30%	0.10 -0.2%
Sulfur	0.15-0.30%	0.15-0.35%	0.15 -0.5%

Ingredients	Grass Hay Analysis	Grass Haylage Analysis	Grass Pasture Analysis
Manganese	30 - 70 ppm	30 - 80 ppm	40 - 90 ppm
Iron	80 - 200 ppm	80 - 200 ppm	100 - 300 ppm
Molybdenum	1 - 5 ppm	1 - 5 ppm	2 - 10 ppm
Copper	2 - 10 ppm	4 - 10 ppm	2- 15 ppm
Zinc	10 - 30 ppm	10 - 30 ppm	10 - 30 ppm
Iodine			0.3-0.8 ppm
Selenium			0.02-0.15 ppm *

* Newmarket values found to have lower range of 0.02-0.05 ppm

ppm = mg/kg

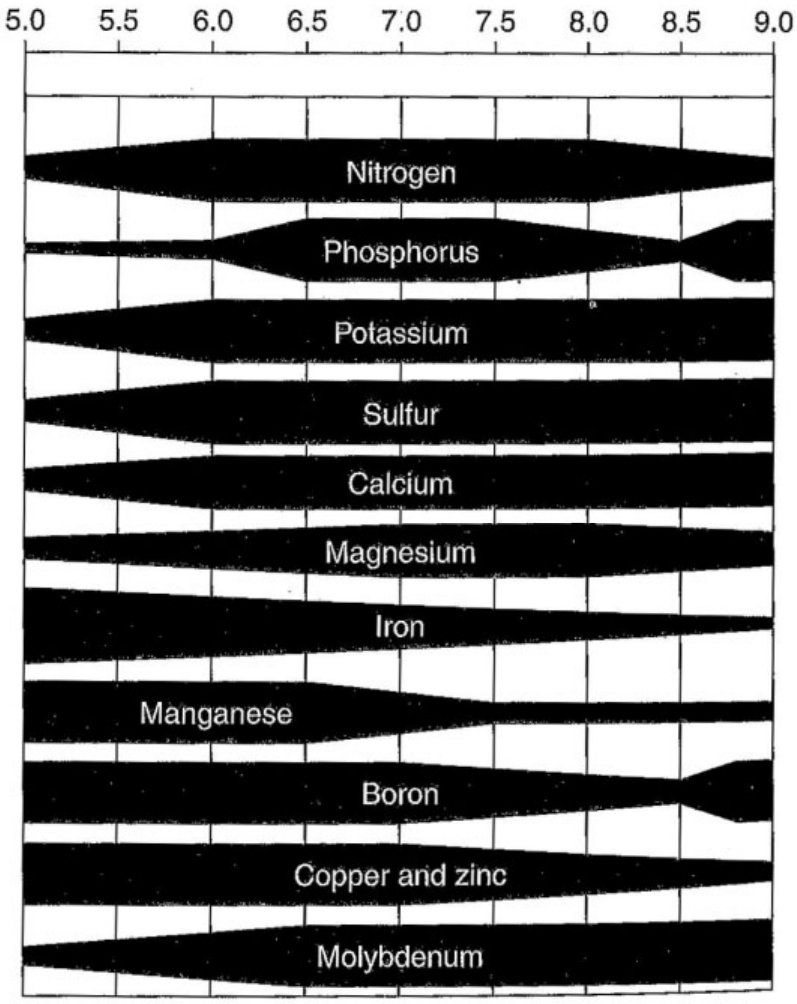


Figure 1 The relative availability of nutrients essential for plant growth at different soil pH levels.

Nutritional requirements

Comparison of the Recommended Allowances for Performance Horses While Layed Up or in Light, Moderate, or Intense Training on a Total Ration Dry Matter Basis (Including Forage)

	LAID UP OR IDLE		*LIGHT*		*MODERATE*		*INTENSE*	
NUTRIENT	**2 YEAR OLD**	**MATURE**	**2 YEAR OLD**	**MATURE**	**2 YEAR OLD**	**MATURE**	**2 YEAR OLD**	**MATURE**
Dry matter intake % bodyweight	1.5 - 2.0	1.5 - 2.0	1.75 2.25	2.0 - 2.5	2.0 - 2.5	2.5 - 3.0	2.5 - 3.0	3.0 - 3.5
Crude protein %	11	8.5	12	10.5	12.5	11	13	12
Calcium %	0.53	0.3	0.55	0.4	0.56	0.42	0.57	0.48
Phosphorus %	0.35	0.21	0.36	0.27	0.37	0.28	0.38	0.3
Potassium %	0.53	0.4	0.7	0.7	0.8	0.8	0.9	0.9
Magnesium %	0.12	0.1	0.19	0.18	0.21	0.2	0.23	0.22
Sodium %	0.14	0.14	0.16	0.16	0.18	0.18	0.2	0.2
Manganese mg/kg	45	40	50	45	50	45	50	45
Iron mg/kg	60	40	80	80	80	80	80	80
Copper mg/kg	20	15	20	15	20	15	20	15
Zinc mg/kg	60	40	60	55	60	55	60	55
Cobalt mg/kg	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3
Iodine mg/kg	0.25	0.25	0.3	0.3	0.3	0.3	0.3	0.3
Selenium mg/kg	0.2	0.15	0.2	0.2	0.25	0.25	0.3	0.3
Vitamin A IU/kg	2000	2000	2500	2500	2750	2750	3000	3000
Vitamin E IU/kg	80	50	80	80	80	80	80	80
Thiamine mg/kg	3	3	3	3	3	3	3	3
Riboflavin mg/kg	2	2	2	2	2	2	2	2

* Feed intake is determined by body capacicty, physiologic status, activity level, relative feed value of forage and environment. Needed digestible energy (Mcal/day) is determined by body size, metabolic rate, growth rate, dry matter consumption and body condition score.

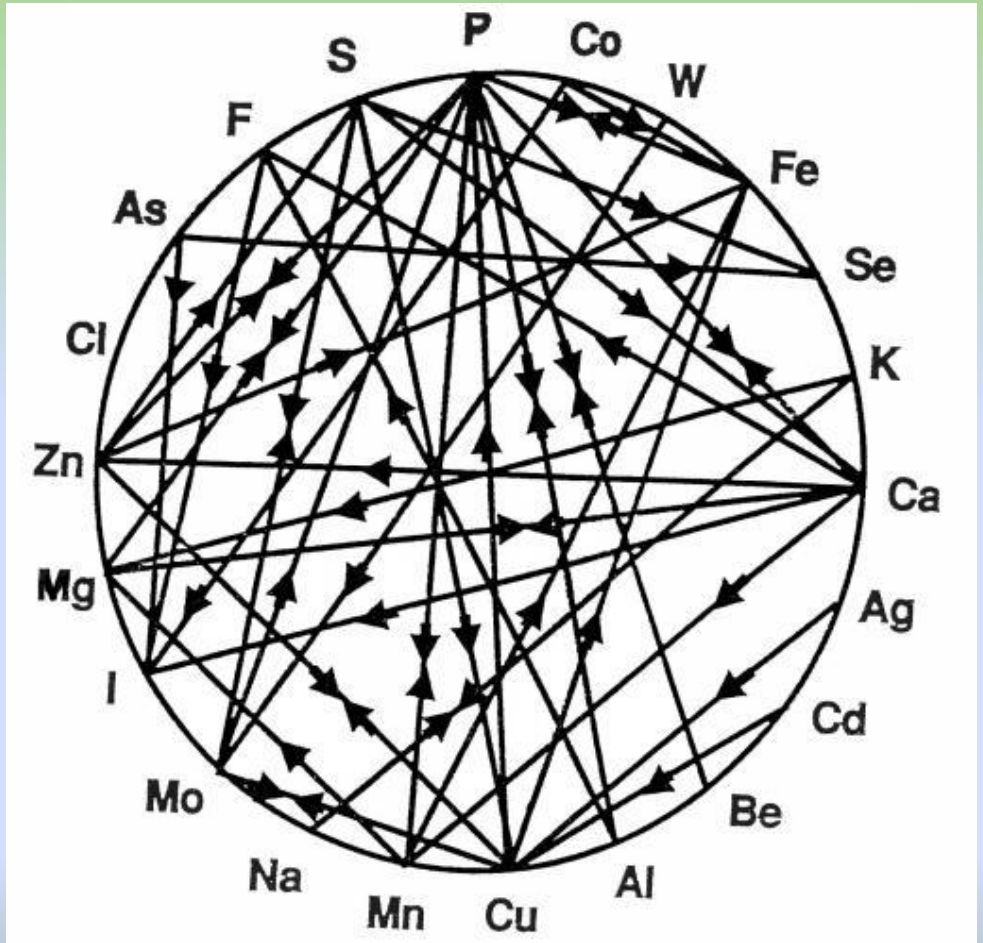
Vitamins and Minerals

- The most expensive components of a feed.

- Involved in ALL metabolic functions – utilisation of energy substrates, muscle function, immune response, bone and cartilage, hormones and enzymes etc.

Minerals

- Forages alone will very rarely meet mineral requirements.
- Minerals are vulnerable to interactions.



Minerals

- Å Calcium – Bone structure, muscle/nerve function.
- Å Phosphorus – Bone structure, energy utilisation.
- Å Potassium – Muscle activity.
- Å Magnesium – Bone/teeth structure, enzyme activity.
- Å Copper – Haemoglobin, cartilage/bone formation.
- Å Zinc – Involved in protein & carbohydrate metabolism, immunity.
- Å Selenium – antioxidant works with Vit E.

Some of the effects of deficiencies

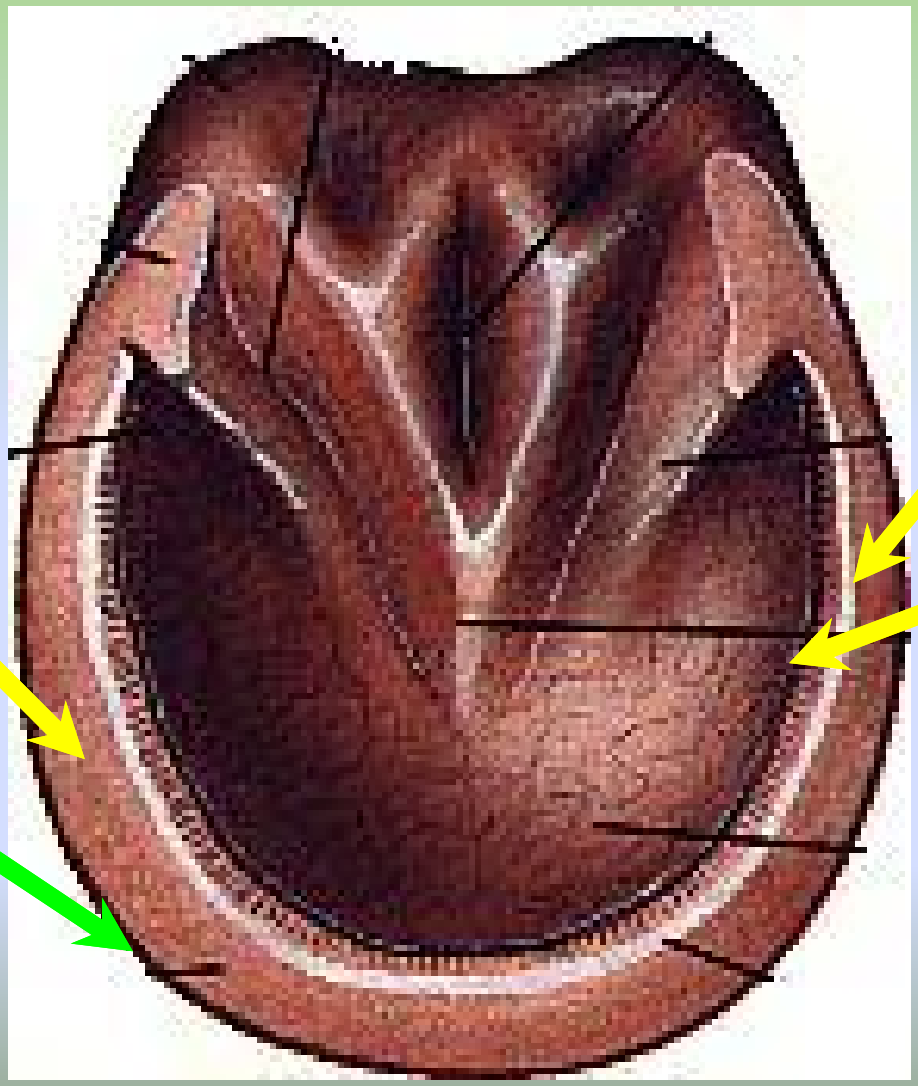
- Deficiencies of Copper, Zinc and Manganese can affect normal bone development and lead to cartilage defects in growing youngsters.
- Copper deficiency can lead to anaemia in old and young alike especially competition horses. Low Mn and Zn can affect utilisation of energy.
- Poor Sulphur & protein – poor hair coat, mane and tail growth – brittle.
- Avoid excess P on land through over fertilisation as this can lead to depressed Calcium absorption

Nutrition Composition of the Hoof Wall

Nutrients found in the wall structure:

1. Protein/Amino Acids (94 %)
2. Fat/Oils (3 %)
3. Sulfur
4. Calcium
5. Zinc
6. Copper
7. Selenium
8. Carotene (Vitamin A)
9. Alpha-Tocopherol (Vitamin E)
10. Biotin (Recommend 15 mg/1,000 lb/day for cracked hooves)

Where Nutrition Deficiencies Appear in the Hoof Wall First



Protecting Minerals

- Certain trace minerals can be protected by “chelating” them (attaching them to other molecules).
- Copper, zinc and manganese are most commonly chelated.
- Iron can be but is it worth it as most horses have plenty of iron in their diets?

Vitamins

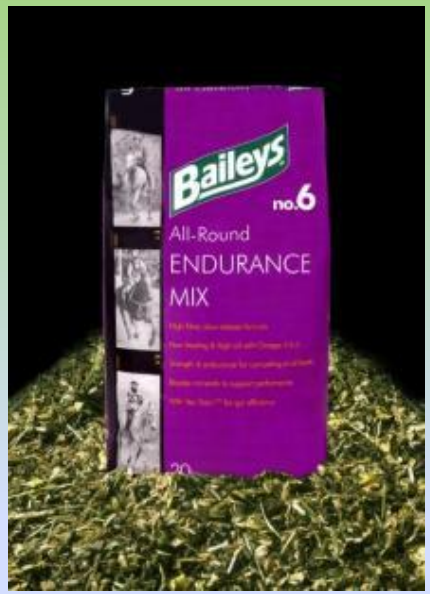
- Vit A – Bone remodelling, muscle, skin & hoof growth, reproduction, eye function.
- Vit B – metabolism carbohydrate, protein & fats.
- Vit C/E – antioxidants.
- Vit D – Calcium and phosphorus absorption.
- Vit K – Blood clotting.

Solutions


Baileys
no.19
£2
PERFORMANCE
BALANCER


Baileys
Lo-Cal
balancer


Baileys
EVERYDAY
HIGH FIBRE
CUBES
20kg


Baileys
no.6
All-Round
ENDURANCE
MIX


Baileys
STUD
BALANCER


Baileys
FEED BLOCK


Baileys
no.4
TOP LINE
CONDITIONING
CUBES
Baileys
no.17
TOP LINE
CONDITIONING
MIX

Balancers

- Very concentrated
- Lo-Cal = 16% protein, 3 % calcium BUT only < 8% starch.
- Much lower feeding rates.
- 1lb Lo-Cal balancer equivalent to 4 lbs of standard horse & pony feed in terms of vits & mins but lower protein and energy.
- Overall nutrient intake is not excessive.

Laminitis

What Are The Nutrition Related Causes of Laminitis?

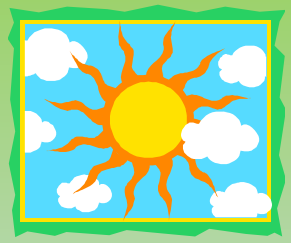
Starch overload from cereals

Fructan overload from pasture

Fructans - What Are They?

- Most plants store sugar in the form of starch e.g. cereals.
- Grasses from temperate regions store their sugars as fructan (Longland & Cairns, 2000).
- Many factors affect the amount of fructan that accumulates in grasses.

Levels of Fructans



- Temperature - cool temperatures (5-10°C) produce much higher fructan levels than warm conditions (11-25°C) (Chatterton *et al*, 1989)
- Hence why classically a spring and autumn problem
- If the temperature is below 5°C grass does not grow
- However, if light is available it can still produce sugars
- Cold, bright conditions (winter) can result in increased levels of fructans

Limited Grazing

- The ‘good doer’ is often stabled or on restricted grazing in the summer.
- Although it is the best way to reduce their waist lines and help prevent laminitis they do miss out on valuable nutrients.
- Dried forages replace their requirement for fibre but has fewer nutrients than grass.
- Important to feed a low calorie concentrate ration.

Any Questions?