

NUTRITIONAL MANAGEMENT FOR OBESITY, EQUINE METABOLIC SYNDROME & EQUINE CUSHINGS DISEASE

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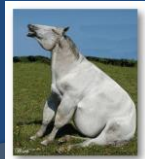
Presentation outline

- ◉ Introduction
- ◉ Obesity
- ◉ Equine Metabolic Syndrome (EMS)
- ◉ Pituitary Pars Intermedia Dysfunction (PPID)
- ◉ Hind Gut disturbances
- ◉ Acute Laminitis
- ◉ Conclusion



Introduction

- ◉ Horses live longer & have better care
- ◉ Many treated as companion animals/pets
- ◉ Overfeeding
 - Lush pastures
 - Higher energy feeds
- ◉ Less work & exercise
- ◉ Shelter from weather
- ◉ Better parasite control
- ◉ Better health care



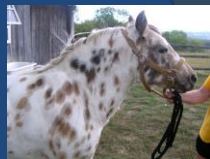
"The Good Doer – Easy Keeper"

- Able to maintain body condition on less than average amounts of energy/feed.
- Can easily become obese



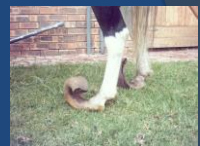
Risk Factors for Obesity

- ◉ Certain Breeds
- ◉ Too little work/exercise
- ◉ Show ring & owner expectations
- ◉ Good pasture - high energy
- ◉ High energy hay
- ◉ xs energy from concentrates



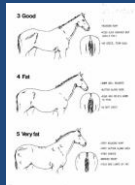
Assessment of Obesity

- ◉ Body weight
- ◉ Body condition scoring (BCS)
- ◉ Cresty neck
- ◉ Regional adiposity
- ◉ Heart or belly girth
- ◉ Ultrasound measurement of fat
- ◉ No simple & reliable method
- ◉ Individual variation between people



Body Condition Scoring

- 4/5 or 7/9 is fat
- 4.5-5/5 & 8-9/9 is obese
- BCS doesn't always reflect body fat %

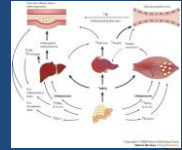


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Effects of Obesity

- Pro-inflammatory state
- Oxidative stress
- Activates cortisol
- Increases risk of many diseases
- Affects insulin sensitivity (SI)
 - Reduced SI as body fat increases (Carter et al 2009)
 - Increased SI as body fat reduces (Van Wyenbergh et al 2008)
- Extra weight on joints etc
- Reduced exercise



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Obese Horses

- Reduce calorie intake
 - Low carbohydrates
 - Low fat
 - Higher fibre
 - Balancer pellet
- Exercise vital to increase calorie output



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Exercise vital for a negative energy balance

- Increased energy output
 - Voluntary – need space
 - Forced – if not lame
- Benefit of Grazing muzzle
 - Allow passive exercise
 - Muzzled horses 'play' more
 - 83% reduced DMI in 3h (Longland et al)
 - 4-45% reduced DMI over 24h (Glunk et al 2013)
 - Result depends on design & grass type



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Feeding the Obese Horse or Pony

- No grain or treats
- No fat supplements
- No pasture or limited pasture
- Restricted forage intake – 1 – 1.5% BW
- Protein, vitamin and mineral supplement

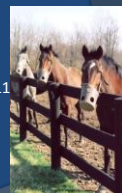


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Access to Pasture

- Care with both calories and carbohydrates
- Maintenance needs: 1.5-2% BW in 24h, but some can eat 5% BW
- Can consume 40% DM needs in 3h & 100% in 12h
- Can eat 55% DE needs in 3h (Longland et al 2011)
- Some can't have any pasture
- Others restricted at risky times of year
- Short grazing periods
- Strip grazing or after mower, other stock,



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Forage intake

- Feed for weight loss – 1 – 1.5% BW
 - 1.5% BW initially
 - Reduce to 1.25% & no lower than 1%
- Low NSC, mature grass hay – test or soak
- Avoid legumes – protein & energy is too high
- Chaff ok, care with grain
- Straw ok – care impaction, EGUS
- Small hole haynet/feeder useful



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Slowing hay intake

- Horses fed hay in small hole hay nets had sig slower hay intakes when fed 1% BW grass hay

	Control	Large Hole	Med Hole	Sm Hole
Size Hole		15 cm	4 cm	3.2 cm
Rate Intake kg/h	1.5*	1.33**	1.11 ***	0.88 ****
% Consumed in 4h	95 *	95 *	89 **	72 **

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Slowing hay intake -Porta Grazer



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Soaking hay

- Washes out WSC, amino acids & macro minerals
- Variable effect
- Better results over longer time & hot water
- Volume soak water imp
- Soak and rinse
- Rec. 60 min in cold & 30 min in hot water
- Can get up to 40% reduction in NSC & 7% reduction in DE content of hay (McGowan et al 2012)
- Significant reduction in AUC & peak insulin (Cottrell et al 2005)

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Materials and Methods

- The STEAMED hay was placed in a HAYGAIN HG-600 half-bale hay steamer and allowed to reach a temperature of 170°C.
- SOAKED hay was submerged for 1 hour in 68L of ambient temperature water and allowed to drain for 30 minutes in hay nets before feeding.

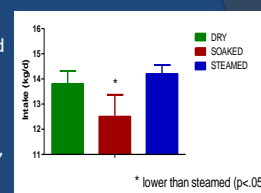


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Results- Ad lib hay intake

- During week 1, voluntary daily hay intake (air-dry/as fed hay equivalent) averaged 13.8 ± 0.3 , 12.5 ± 0.5 and 14.2 ± 0.2 kg (mean \pm SEM) for the DRY, SOAKED and STEAMED hay, respectively.
- These intakes equaled 2.1%, 1.9% and 2.2% of BW/day. STEAMED intake was significantly higher than SOAKED ($p < .05$).



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Rate of Intake and chewing rate

	as fed basis			DM basis	
	Intake	Chews	Chews	Intake	Chews
	g/min	/100g	min	g/min	/100g
DRY	31 ± 1.7	212 ± 12.9	66 ± 3.6	29 ± 1.4	233 ± 12.7
SOAKED	72 ± 6.6*	90 ± 9.0*	63 ± 2.1	28 ± 3.1	235 ± 28.1
STEAMED	32 ± 2.2	194 ± 1.1	62 ± 3.8	27 ± 1.5	234 ± 4.9

When expressed on a 100% DM basis, rate of intake and chewing rate were not different between treatments.



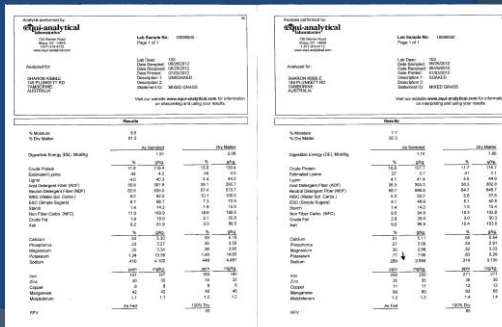
Nutrient Composition (100% dry matter basis)

		DRY	SOAK	STEAM
Crude protein (CP)	%	7.0	7.1	7.1
Acid detergent fiber (ADF)	%	39.7	42.7	40.3
Neutral detergent fiber (NDF)	%	64.5	70.9	67.1
Non fiber carbohydrate (NFC)	%	20.8	14.7	18.3
Starch	%	0.6	0.4	0.3
Water soluble carbohydrate (WSC)	%	20.2	16.9	19.6
Nonstructural carbohydrate (NSC)	%	20.8	17.3	19.9
Crude fat	%	2.0	1.8	1.8
Ash	%	5.7	5.4	5.7

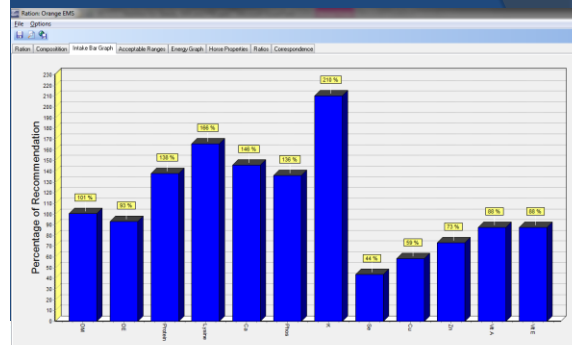
The fiber components (ADF and NDF) of the SOAKED and STEAMED hays were greater than the DRY hay (100% DM basis). This was due to a loss of other components (WSC and NSC) from the SOAKED and STEAMED hays.



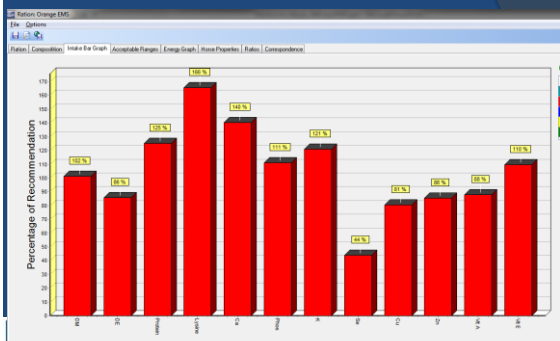
Effect of Soaking Hay



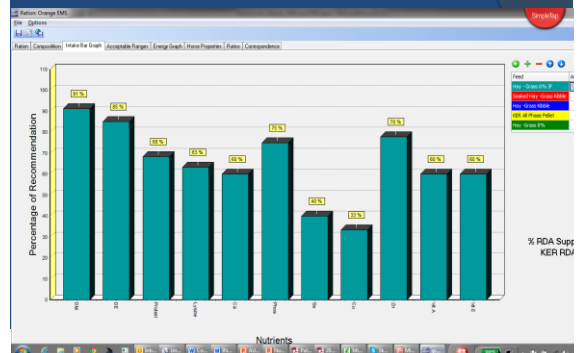
Unsoaked hay – 11% NSC



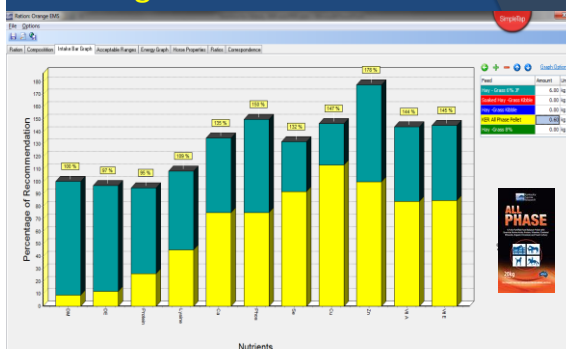
Soaked hay – 7% NSC



Forage only diet - Nutrient deficiencies



Forage and Balancer Pellet



Results of Weight Loss Programs

- Use DM intake of 1-1.5% or 70 % DE req
- Wide variation in individual results
- Lose gut fill in first week
- Reduced basal metabolic rate in response to diet, unless exercised
- Expect loss of 0.5-1% BW per week
- Monitor BW, girth, sc fat thickness

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Equine Metabolic Syndrome (EMS) - Insulin Resistance (IR)

- Reduced SI & higher blood insulin levels
- Associated with obesity but not all IR are obese
- Ponies have IR relative to horses
- Pregnancy induces IR
- Pain, stress induce IR
- Major laminitis risk

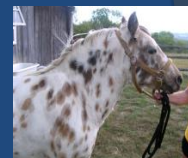


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Equine Metabolic Syndrome/ IR

- Mainly pony breeds esp. Welsh, Dartmoor but also WB, QH, draft
- Body weight normal to obese
- If normal have some fat redistribution (bulging supraorbital fat, enlarged crest, fat pads)
- Ongoing laminitis or history
- IR ponies had 10x risk of laminitis in spring



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Insulin Resistance – Effect of Feeding

- High starch/sugar feeds induce mild IR
- High fat induces IR – saturated fat worse than PUFA
- Long chain Omega 3 FA DHA & EPA activate genes that positively regulate glucose & insulin levels
- High protein may induce IR, but may reduce appetite (man)
- Soy protein has led to reduced IR in man & rats
- Glucosamine may increase IR
- Pregnancy induces IR

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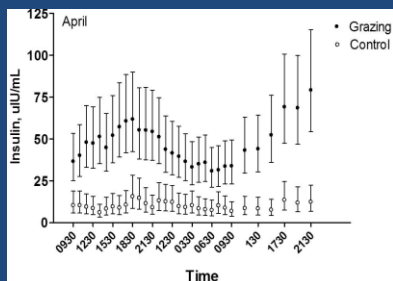
Is it starch, sugar or fructan that is the risk?

- Digested starch and sugars lead to insulin rise
- Undigested starch & fructans lead to hind gut acidosis
- VTU risk factor study found no change in WSC but sig. ↑ in starch assoc with clinical cases of laminitis
- But max starch only 8%
- Soaking hay halves WSC & ↓ glucose & insulin
- Fructans can ↑ insulin levels & may lead to oxidative stress in hepatocyte & IR
- Probably a combination of risk factors

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Diurnal Insulin Levels



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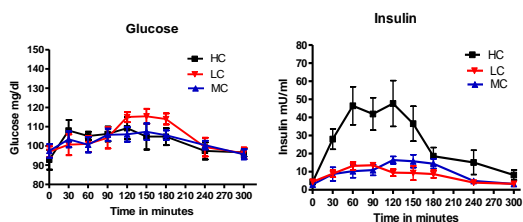
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Carb. content of hay affects Rate of Intake

- 3 hays fed at 0.5% BW
- HC – 17% NSC, MC – 11% NSC, LC 4% NSC
- HC consumed 30% faster than LC

Time (min)	HC	LC	MC
PSSM n=7	104 ± 28	131 ± 31	140 ± 46
Controls n=5	68 ± 25	93 ± 24	96 ± 16

HC hay – Higher Insulin level



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Feeds for Obese EMS Horse

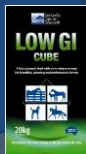
- No grain or sweet feed, treats
- Allow pasture only after IR is controlled
- Feed for weight loss – 1 – 1.5% BWt
- Avoid legumes – protein & energy is too high
- Low NSC, mature grass hay – < 10-12% NSC
- Low calorie/intake balancer
- Washed beet pulp or soy hulls ok but DE higher than hay
- Antioxidants – Vit E, Se

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Feeds for Non Obese IR Horse

- Low GI feed is needed
- Low - moderate NSC feed (< 22% NSC)
 - Mod CHO feed can increase SI
- Need label data or test to identify suitable feed
- Legume based forages ok
- Non-molassed beet pulp, soy hulls ok
- Oil or Equi-Jewel bran ok - low intakes
- Care xs fat – reduced SI
- Small feeds



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Fish oil & Glucose dynamics

- Link in some species between high fat diets and IR
- Equine studies indicate increased glucose response to IVGTT (reduced SI) in horses fed a high-fat ration compared with moderate NSC diets (Perry et al 2009, Pagan et al 2012)
- Long chain ω 3 fatty acids (DHA & EPA) from fish oil improved SI in some species, incl exercised horses (O'Connor et al 2004)
- Fish oil moderated the glucose response in horses, with supplemented horses having lower meal-related glucose AUC compared with control group (Hoffman 2011)
- Fish oil increased SI in IR mares (Hess et al 2013)
- Fish oil improved glucose clearance in aged horses fed a high fat diet (Huntington et al 2013)

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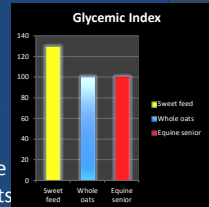
Feeding Strategy for Horses with PPID

- A ration that produces a low glycemic response is essential
- avoid rations that contain CHO-FR such as lush pasture and high grain meals
- Need supply the correct caloric intake to maintain or achieve a desired body condition
- add vitamins and minerals for a balanced diet
- Higher anti-oxidant intakes



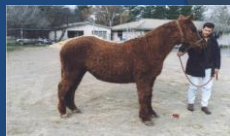
Horses with PPID and Glycemic Index (GI)

- Pellets & some extruded feeds have lower NSC & GI than sweet feeds
- vegetable oil can reduce GI
- rice bran also has a low GI
- if beet pulp is added, it should be rinsed to reduce its GI
- Senior feeds may not be desirable since they may contain ingredients such as molasses which produce a high GI



Horses with PPID & good BCS

- Feed as a normal horse
- Forage based program
- Care lush pasture
- Need for concentrates varies
 - Balancer pellet
 - moderate CHO/low GI feeds
- Small meals & slow intakes



Obese horses with PPID

- Feed as for EMS cases
- Forage based diet
 - moderate quality hay
- Control pasture intake
- Low intake balancer pellet



Thin horses with PPID

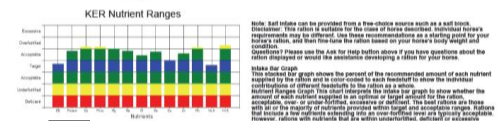
- Challenging
- Condition of teeth imp. – can it chew hay?
- Care with pasture – quality & quantity
- High DE hay eg lucerne
- Super fibres
- Fat
 - oil or stabilised rice bran
 - added to feeds
- Low to moderate NSC feed



MicroSteed Ration Report

Prepared By: Ms. Luisa Wood (lwood@ker.com.au)
 Horse Name: Underweight Cushings Pony
 Breed: Connemara
 Gender: Gelding
 Classification: Performance
 Date: Feb 22, 2015
 Age: 19 years
 Weight: 400 kg
 Body Condition Score: Thin
 Sub-class: Light

KER Recommended Daily Intake			Recommended Daily Ration	
Amount	Type	Feed Name	Amount	Type
3.8 kg	Forage	Vic Grass Pasture	2.0 kg	Forage
2.0 kg	Feed	Prime Lucerne Hay	2.0 kg	Feed
30 g	Supplement	KER LGI Cube	30 g	Supplement
0.5 kg	Supplement	SALT	0.5 kg	Supplement
4 g	Supplement	KER EQUI-JEWEL	4 g	Supplement
				Supplement
				KER Rx Nano-E



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 Polley Agriproducts
 Melbourne, VIC 3000
 www.barastochorse.com.au

Is Hind Gut Acidosis an Issue?

- HGA is involved in some laminitis cases/models
 - Grain/starch overload
 - Oligofructose overload from lush pasture
- Is HGA involved in EMS laminitis cases?
 - HG disturbances may have secondary role when combined with hyperinsulinaemia



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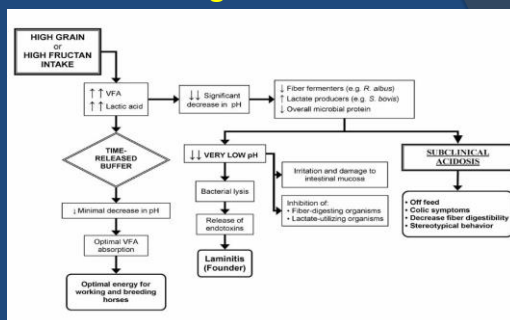
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Starch/Fructan Overflow into Hindgut

- Starch digestibility variable and fructans undigested in Sml
- Undigested starch & fructan move to hindgut
- Microbial fermentation
- Produce acidic waste-products
- pH drops (more acidic)
- Low pH kills bacteria
- Dead microbes release toxins
- Hind gut Acidosis**
 - Sour/acidic smelling wet manure
 - Laminitis trigger factors



Hindgut Acidosis



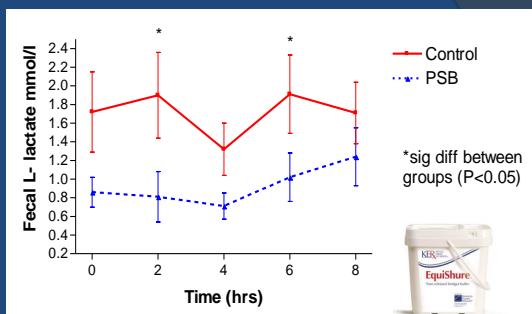
Signs of Hindgut Acidosis

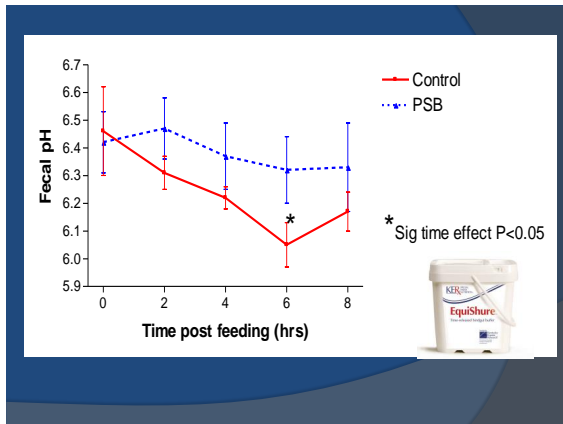
- Decreased appetite.
- Discomfort
- Sour/acidic smelling sloppy manure
- Colic risk.
- Laminitis risk.
- Reduction of feed conversion efficiency.
- Wood chewing, weaving, and stall walking
- Other behaviour changes
- Long-term exposure of the intestinal lining to a low-pH environment may negatively affect the absorptive capacities of the gut, limiting the amount of energy available.



KER Research on Hindgut Acidosis

- 4 TB horses
- Switchback design
- 3 kg grain twice day
- 2 kg hay twice day
- 150 g protected sodium bicarbonate or control





Avoid Hind Gut Acidosis

- Small meals
- Slow Intake with chaff
- Low starch/sugar feeds
- Processed grains
- More energy from fat & fibre
- Care with pasture fructans
- More fibre – hay
- Avoid rapid diet change
- Buffer – KERx EquiShure
- Yeast cultures



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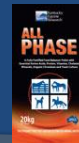
Feeding after onset of Acute Laminitis

- Remove dietary risk factor – pasture or grain
- Supply energy & protein needs for maintenance
- Pain increases metabolic rate & needs
- Don't starve now – manage obesity later
 - 1.5- 2% BW hay
- Lucerne is ok now
- Super fibres ok
- Feed off ground



Supplements after onset of Acute Laminitis

- Low intake (100g – 1kg) balancer pellet to supply amino acids, vitamins and minerals
- Encourage hoof growth – biotin, zinc, methionine
- Antioxidants are valuable to combat Oxidative stress
- Equi-Shure – hind gut buffer



Conclusion

- Increasing no. of cases of obesity, EMS & PPID.
- Challenging cases to feed.
- Careful management of nutrition is imp.
 - Calorie intake
 - Source calories
 - NSC intake vital
 - Supply balanced diet, not just grass hay
 - Higher levels antioxidants
- Professional advice – advice@ker.com, 1800 772 198

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Welcome to the MicroSteed™ Ration Wizard

Do you have questions about which feed is appropriate for your horse? Are you wondering how much you should feed? Have you been thinking about switching to a new feed? MicroSteed™, an online program from Kentucky Equine Research and its international network of Team Members, can help you answer these questions.

It's simple! Answer a few questions to describe your horse. Then, select the Team Member feed you'd like to try from a range of feeds that has been preselected by KER as appropriate for your horse's situation.

We'll provide you with a ration that meets your horse's energetic and nutritional needs based on the information you've provided.

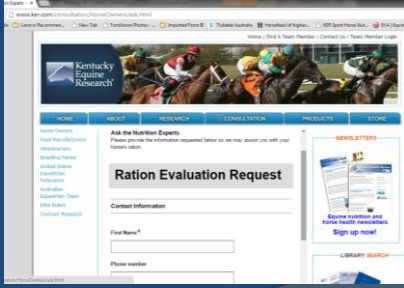
Recommended daily nutrient intakes are based on the Kentucky Equine Research and National Research Council recommendations for optimal equine nutrition.


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advice@ker.com, 1800 772 198



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