

Equine Breeders News

The Glycaemic Response - what is it, what effect does it have and is it important?

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What is it?

The phrase "Glycaemic Response" has been used extensively in the equine press recently but what does it really mean?

When a horse is fed a meal there is a subsequent rise in plasma glucose that is the result of food being digested in the horse's small intestine and the resultant end product, glucose, being absorbed across the gut wall into the blood.

The rise in plasma glucose is known as the glycaemic response and it occurs after providing a wide variety of different carbohydrate-containing feeds.

The extent of the increase in plasma glucose following a meal or the magnitude of the glycaemic response depends on a number of factors that are listed below:

- Meal size
- Type and quantity of carbohydrate
- Extent of food processing
- Duration and effectiveness of chewing
- Provision of additional feeds before, with or after meal
- Individuality of animal

What effect does it have?

A rise in plasma glucose stimulates the release of insulin from the glandular part of the pancreas in order to normalise blood levels of glucose (return them to resting values).

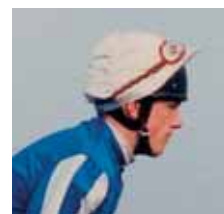
Insulin stimulates the removal of glucose from the plasma and its uptake by the cells where it is needed as an energy source. Glucose that is excess to this need can be made into glycogen in both the liver and muscle.

Once these stores are 'full', further amounts of glucose are stored as fat. Horses adapted to high starch diets have a high insulin sensitivity compared to those animals fed solely on forage. Insulin sensitivity can be determined by conducting a glucose tolerance test where the animal is 'loaded' with a test dose of glucose and then subsequently, plasma glucose and insulin are measured over the following 0 to 5/6h. 'Sensitive' animals show rapid responses whereas 'insensitive' animals

Meet the team

Will Humphreys

Will Humphreys has been part of the Dodson & Horrell Thoroughbred Team for over two years. Previous to this Will had great success as a National Hunt Jockey, riding for 13 years and still rides out for a local trainer. During his time as a jockey Will worked for many leading trainers and gained valuable experience during this period.



Will covers the South of England working with professional yards providing nutritional advice and support. If you would like to arrange a visit please contact Will directly on 07753 818711.

Brent Adamson

Brent Adamson joined the Dodson & Horrell Thoroughbred Team in 2001. Working as a National Hunt Jockey and later as an assistant trainer and private trainer Brent experienced all aspects within the professional equine industry.



Brent covers the North of England working with professional yards providing nutritional advice and support. If you would like to arrange a visit please contact Brent directly on 07733 268218.

Susie Blackburn

Susie Blackburn has been working for Dodson & Horrell for over 5 years. After completing a Biology degree at University Susie went on to gain much experience during her employment on professional yards. During this period Susie also gained several equine qualifications.



Pic by Gillian Stuart

Susie works within the South of England visiting yards and Studs providing nutritional advice and support. If you would like to arrange a visit please contact Susie directly on 07803 1185488.

Louise Jones

Louise Jones qualified from University with a BSc (Hons) in Equine Science, during which she specialised in breeding science and went onto graduate with an MSc in Equine Science in 2000. Louise began working as an Equine Nutritionist for Dodson & Horrell Ltd in 2002. Her work involves visiting equine businesses, including studs, and liaising with many leading veterinary surgeons to advise on all aspects of nutrition. You can contact Louise directly 07884 435998



show a slow and prolonged response. Native ponies are typically insulin resistant so that a meal of starch would be followed by a prolonged raised plasma glucose value.

Is it important?

A recent study (Pagan *et al.*, 2001) conducted amongst Thoroughbred weanlings in Kentucky to examine the relationship between the glycaemic response following feeding and the incidence of Osteochondritis dissecans (OCD) produced an interesting result. Within each stud farm there was no significant difference in the glycaemic response to a meal between horses that had OCD lesions and those animals that were normal. Furthermore, of all the weanlings, those animals that had surgically treated OCD lesions showed higher blood glucose values.

So perhaps we can conclude from this study that, those animals that develop OCD lesions are likely to handle the processing of glucose differently from those animals that do not show lesions. This individuality in metabolism (higher blood glucose) could be explained on the basis of different genetic make-up as only a few animals on each stud developed the problem although all were fed the same. Thus, the nature of the diet (its ability to generate a glycaemic response) is probably less important than some people may have thought and that we should, in fact, be investigating genetic susceptibilities and more sophisticated nutrient-hormone interactions. Certainly, the glycaemic

response to a meal was the same for both affected and unaffected animals. The glycaemic effects of meals fed to youngstock have been reduced by including fat and fibre in place of starch. Their effects on bone density have been assessed and compared against those animals fed the more conventional, starch-rich diets that are known to produce large glycaemic responses. Bone mineral content was lower for several months in foals fed the high fat/fibre diet than in foals fed a typical textured 'sweet feed', rich in starch and sugar (Hoffman *et al.*, 2000). This further suggests that the glycaemic response produced by a meal is perhaps of little relevance to the onset of DOD in foals.

Finally, remember that a meal of hay alone results in a glycaemic response and that the glycaemic response in horses remains to be objectively characterised. A glycaemic index (comparing the glycaemic response to a food to that of a standard food such as oats) has been proposed as an alternative to the glycaemic response as a means of comparing horse feeds. It has been used to characterise human foods but is generally regarded as unreliable because the glycaemic response is affected by so many different factors (as in the horse-see above). It is thus not a unique feature of a foodstuff but rather, a variable result of feed interactions and is thus of limited value in describing any food because the latter may be used by the animal in so many different ways.

Grass Growth a Problem Potential Effects on Growth Rates

Louise Jones MSc, BSc (Hons) Nutritionist

Lack of rain and warm temperatures last year seriously impacted on grass growth. In May last year it was estimated that the energy content of grazing was nearly 10% lower than the average for the past four years and this had serious implications upon youngster's body condition.

Many studs reported that weanlings were developing 'pot bellies' and their body condition declined dramatically shortly after weaning. Although with correct supplementary feeding these issues were quickly resolved one must bear in mind that if the spring of 2004 is anything like that of 2003 this may again be an issue.

"In May last year it was estimated that the energy content of grazing was nearly 10% lower than the average for the past four years."

The lack of a spring flush of grazing not only meant that the grass vitamin and mineral content was reduced, which obviously has important implications for correct bone development but also the energy and protein content was lower than typically found at this time of year.



DENSE CORRECT ATHLETIC BONES = DCAB

Louise Jones MSc, BSc (Hons) Nutritionist

The growth rates of the young Thoroughbred horse must be carefully managed. This is particularly true in the context of bone development where bone must be adequately mineralised and strengthened in order to withstand the demands placed on it during training.

One of the most important factors in preventing bone related disorders is Dietary Cation Anion Balance (DCAB). Even horses receiving adequate levels of dietary calcium may actually be excreting calcium from their bone if their DCAB is imbalanced. Scientific research has demonstrated that a DCAB of at least 250 mequivs/ kg concentrate feed is crucial to achieve and maintain healthy bone. A DCAB lower than 250 mequivs/ kg may result in bone mobilisation and calcium excretion, which could have a detrimental effect on bone formation.

All Dodson & Horrell Thoroughbred stud feeds have been formulated to ensure a DCAB of at least 250 mequivs/kg, therefore helping to ensure correct bone development when fed alongside good quality forage.

DIET A

6kg Hay

5kg Dodson & Horrell Yearling Cubes

DCAB = 350

DIET B

6kg Hay

5kg Oats

DCAB = 210

Therefore in order to meet the nutritional requirements of the young growing Thoroughbred concentrate feeds were required to be introduced earlier and fed in larger quantities to sustain optimal body condition and growth.

Furthermore, the high proportion of indigestible fibre in the grass would have significantly contributed to the youngsters 'pot bellied' appearance and lack of grazing necessitated the introduction of alternative forages such as hay and haylage at a time when grass is usually available in abundance.



DEVELOPMENTAL DISEASES AFFECTING GROWING HORSES

Leo Jeffcot, MA, BVetMed, PhD, FRCVS, DVSc, VetMedDr

Department of Clinical Veterinary Medicine

The problem

Over the last 25 years much has been written about developmental conditions of foals. In 1986 it was decided to collectively group all these conditions into a single category called "Developmental Orthopaedic Disease" (DOD) (McIlwraith 1986). Although it is logical to group these conditions as there are similarities between some of them and they all appear during the growth period. Perhaps a more appropriate title might be simply "Developmental Skeletal Problems" (DSP).

General comments on Developmental Skeletal Problems

The prevalence of these conditions can be unacceptably high on some stud farms and most breeds are susceptible. These conditions are all associated with growth and are seen particularly in foals that are growing rapidly or not fed an adequate diet. The disease complex is believed to be associated with abnormalities of skeletal growth which begins with the conversion of cartilage to bone by the process of endochondral ossification. In addition to rapid growth and nutritional aspects other important features of pathogenesis include biomechanical stress on joint and growth cartilage, hormonal changes and a genetic predisposition.



Fig.1 7-month Thoroughbred foal that has had a rapid growth pattern and exhibits clinical signs of osteochondrosis of both hocks and stifles, physitis of both carpi, flexural deformities of both forelimbs and acquired kyphosis of the thoracolumbar spine.

What is the extent of the problem?

It is difficult to estimate the full extent of DSP in the horse population. There have been many incidence surveys based largely on clinical or radiological evidence. It is likely therefore that they are an underestimate of the real figure. The estimated prevalence of DOD has been reported as high as 50% (Knight et al 1985; O'Donoghue et al 1992). It is also clear that a balanced diet and affective stud management play a large part in reducing the

incidence. Furthermore, many foals recover spontaneously (Sandgren et al 1993; Aznam 1994). Another concern about DSP is to know whether the problem is progressively increasing over time. There are anecdotal reports on this, but no firm epidemiological data available at present. This raises the question of how important is the genetic involvement in pushing up the overall incidence. Apart from establishing that conditions like OC have some hereditary component there is no specific information.

Diagnostic challenges

Many of the DSPs are readily diagnosable by clinical observation and radiographic examination. However, early recognition is crucial as treatment and management of the problem are always much more effective in the early or mild stages of the conditions.

Careful clinical examination of foals and regular weighing to measure average daily gain (ADG) and monitor growth rate is particularly helpful. Many problems will be recognised in this way and by controlling growth rate and implementing proper mineral control can be overcome.

The other principal aid to diagnosis is radiographic examination (Falk-Rønne & Kristoffersen 1980; Hoppe 1984; Sandgren et al 1993; McIntosh & McIlwraith 1993). The use of ultrasound to estimate thickness of articular cartilage in the stifle joint in early cases of osteochondrosis may be valuable (Firth & Greydanus 1987; Denoix 1996; Prendegast 2001). The other technique that will become extremely useful is magnetic resonance imaging (MRI) as both bone and soft tissue detail will be detectable.

What are the challenges ahead?

The principal challenge for the future of DSPs is to reduce their incidence and limit the economic "wastage" to the horse industry worldwide. Despite the considerable knowledge achieved in recent years there are still many gaps and unanswered questions.

For example:-

- There have been no prospective epidemiological studies to assess the prevalence of the overall problem and to objectively understand the important influences of nutrition and stud management.
- Evidence based field studies providing significant differences between the outcomes from study groups and control groups to evaluate the effects of introducing improved feeding and nutritional regimes on studs.
- The underlying pathogenesis of all DSPs is still crucial to the future of the horse breeding industry.
- The role of copper and other trace minerals and their influence on the prevalence of DSPs is crucial as there is so much that we do not understand.
- Another exciting area for investigation is to better understand the role of high energy feeding of young foals and the resultant high incidence of OC (Savage et al 1993), hyperglycaemia and hyperinsulinaemia (Ralston 1996).

" Another concern about DSP is to know whether the problem is progressively increasing over time.

We also know that insulin has an effect on maturing chondrocytes in the growth plate (Henson et al 1997).

- The role of biomechanics/exercise needs further in-depth research.
- The other area that very little work has been done so far is to better understand the genetic background of DSPs.



'New added benefits to the Dodson & Horrell Professional Stud Range'

Dodson & Horrell manufacture a specific range of feeds formulated for Thoroughbred horses, in particular those being bred for racing. The range covers all the requirements of breeding and growing animals including broodmares, stallions, foals and youngstock. From the 1st May 2004 the professional stud range will have even more added benefits along with formulations that have been updated in line with the latest research.

The feeds contain an improved fibre, oil, carbohydrate ratio ensuring a balance of energy sources helping stallions to maintain condition and reproductive performance even during the busiest of seasons. Biotin has been included to help improve hoof and coat condition.

A correct ratio of calcium and phosphorus is essential for correct bone development in foals. All Dodson & Horrell Thoroughbred stud feeds have been formulated to ensure a Dietary Cation Anion Balance (DCAB) of at least 250 mequivs/kg as this is one of the most important factors in preventing bone related disorders.

All Dodson & Horrell horse feeds include QLC a unique blend of plant derived anti-oxidants which have been specifically formulated to support the horse's own natural anti-oxidant system. This helps to promote long term health, combat illness and disease along with assisting to promote fertility particularly in stallions.



Benefits of our New Improved Stud Range to your Weanling

Suitable Products:

- Suregrow
- Yearling Cubes
- Rearing Diet

Biotin

- Enhances energy and protein metabolism, thereby encouraging weight gain and muscle development.
- Promotes good hoof growth and condition, which is particularly beneficial to animals suffering from DOD's.
- Helps to improve coat condition.

DCAB

- The weaning period is recognised as a vulnerable time for DOD's. Scientific research has shown that a low Dietary Cation Anion Balance (DCAB) results in calcium excretion from bones.
- All Dodson & Horrell's stud feeds have been formulated to have a DCAB of at least 250 mequivs/kg, to help ensure correct bone development.

Fibre: Oil: Carbohydrates Ratios

- Youngstock can be over exuberant and difficult to handle. By reducing the level of starch in the diet excitable behaviour is minimised.
- Higher levels of fibre help to ensure your youngstock do not develop any stereotypic behaviour such as cribbing.
- Less starch lowers glycaemic response.

Linseed Oil

- It is important that your weanlings not only feel good but also look great.
- Additional linseed is a rich source of omega-3 fatty acids which help to promote good coat condition.

QLC & Vitamin E

- Weaning is a particularly stressful time and young horses are more prone to illness and disease.
- Additional antioxidant protection from both QLC and higher levels of vitamin E help your youngstock to remain healthy.

Thoroughbred Services

Our team of Thoroughbred Specialists are available to visit anywhere in the UK. This provides an opportunity for a private consultation to discuss feed-related issues and to assess any 'problem horses'. The following services are available.

• Complete Ration Analysis

Assessment of nutritional requirements and appraisal of current diet.

• Forage Analysis

Assessment of the nutrient value of hay, haylage or fresh pasture in the Dodson & Horrell laboratory. Samples can be analysed at an independent laboratory to assess the levels of minerals and trace elements on request.

• Costings

Full cost comparisons of current and suggested diets to assist in the financial planning of the yard.

• Comprehensive Recommendations

A permanent record containing ration summaries, analysis results and costings where appropriate can be provided if required.

• On-going Support

Regular contact with your Thoroughbred Specialists to keep you up to date with advances in nutritional science and to discuss any developments at your yard.



Equilac

Nutrition is essential for homeostasis, yet despite this vital role is often given little attention in critical care of the neo-natal foal. Inappropriate nutrition can be life threatening (Ousey 1999).

Equilac is a mare's milk replacer suitable for orphan foals, or if a mare is not providing enough milk to adequately feed her foal.

The main ingredient is high quality spray-dried skimmed milk powder, which provides essential amino acids, vital for growth and development.

According to Dr Ousey of the Equine Fertility Unit many mare's milk replacers have a higher energy content than mare's milk. Obviously the aim of any milk replacer is to mimic as closely as possible what the foal would naturally receive from its dam. Therefore Equilac has been formulated to closely resemble mare's milk thus helping breeders to give their foals the best and most natural start in life.

Normally foals will suckle their dam hourly in the first week of life. Unfortunately feeding guidelines for several commercial milk replacers fail to reflect this. Large infrequent meals have been associated with diarrhoea and foals fed ad-lib generally do not self restrict intake. Thus they may be more at risk of becoming overweight and developing DOD's.

Equilac feeding guidelines try to emulate the foal's natural meal size and feeding frequency whilst taking into account the intensive labour this requires.

Correct nutrition of the orphan foal can be the difference between life and death, success or failure.



If you would like further information on the Dodson & Horrell range of horse feeds please contact our Helpline on 0870 442 3322 (normal national rates apply) www.dodsonandhorrell.com

