

# NUTRITION AND SENIOR HORSES

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**Pat Harris** explains why different approaches are required depending on whether a horse is old in just years or also afflicted with age-related problems

**SOME horses remain physically active and healthy well into their twenties and yet others become “geriatric” by mid-teens.**

These individual differences need to be considered when determining optimal management and feeding practices for the older horse. Healthy older horses do not necessarily require any different diet than their younger colleagues – although issues with mobility, dentition, thermoregulation, insulin resistance and changes in inflammatory status may occur even in the “healthy” older animal and need to be taken into account.

## Introduction

Ageing is usually associated with changes in body composition, physical strength and physiological function. Intrinsic factors, associated with the ageing process itself, contribute to this as well as factors indirectly associated with age, in particular, degenerative diseases secondary to environmental or physical insults that progress with time and, typically, the increased physical inactivity associated with ageing.

However, the physical age an individual horse starts to show signs of ageing is variable and many horses can be maintained in good body condition and continue to be used for athletic endeavours well into their twenties and even thirties. Therefore, we should have a similar goal of optimal nutrition and physical activity for the horses in our care as recommended for ourselves, namely “a

healthy lifestyle, incorporating a well-balanced diet and physical activity, cannot stop the years advancing, but may play a useful part in a healthful, active and independent old age” (Phillips, 2003).

Different dietary approaches may be required, depending on whether the horse is just old in years or is afflicted with one or more age-related problems.

- **Bodyweight, body condition, thermoregulation and age**

The two main clinical situations often associated with difficulty in maintaining weight (loss of teeth plus abnormal wear patterns and pituitary pars intermedia dysfunction or PPID) are common in the older horse. However, in a UK survey, approximately eight per cent of old horses were reported to be underweight, but 10.5 per cent were overweight (Ireland et al, 2011).

This suggests obesity may be as much an issue with older equines as it is in the general horse population, with the associated complications of lameness, laminitis and insulin resistance. Obese old horses also appear to have even greater frequencies of white blood cells producing inflammatory cytokines than do thin old horses (Adams et al, 2009). This suggests obesity may play an important role in the apparent age-related dysregulation of inflammatory cytokine production. Reduction of bodyweight and body condition in fat old horses significantly reduced the percentage of IFN $\alpha$  and TNF $\alpha$  positive lymphocytes and monocytes, as well as circulating concentrations of TNF $\alpha$  (Adams et al, 2009).

Weight loss or difficulty in maintaining adequate body condition is, however, not uncommon in aged horses, and in the survey study of Ireland et al (2011), 17 per cent of owners reported weight loss in their horse in the past 12 months. Clinical evaluation of weight loss in an old horse should also rule out other common causes, such as renal and hepatic disease, as well as pain associated with arthritis (especially of the neck, restricting ability to reach grass or ground-based feed bowls), acute or chronic diarrhoea, and inflammation associated with infections.

The risk of weight loss may be higher in cold winters or very hot summer months, due to the type of forage available and potentially increased difficulties with thermoregulation (McKeever et al, 2000; McKeever and Kearns, 2001). Therefore, ration and general management may be contributory factors in the failure of old horses to maintain acceptable body condition, especially in the winter months.

- **Age and digestive function**

It has been hypothesised that chronic parasitic scarring of the large intestine and abnormal dentition may have contributed to the apparent malabsorption and/or maldigestion (reduced apparent digestion of fibre, protein and phosphorus) reported in some earlier studies of digestion in aged horses (Ralston et al, 2001a). Similar deficits were not found in aged horses studied in the

1990s that had received good gastrointestinal parasite control all of their lives (Ralston et al, 2001a).

This work has been confirmed and expanded (Elzinga et al, 2011). This study looked at diet differences in digestibility in eight adult (five to 12 years) and nine 19 to 28 year-old non-obese, healthy mares of similar stock type breeding, all of which had received regular anthelmintic treatment and had normal dentition. They were evaluated after five weeks on three different commonly fed formulated diets (high roughage, high fat and fibre, and high cereal).

This study suggests that under most practical feeding situations, differences in digestive capacity primarily due to age are unlikely to be present. However, it should be noted this study did not evaluate micronutrient digestibility and retention. Furthermore, the horses were all healthy and further work is needed to evaluate the nutrient requirements of compromised older horses and those with dental disorders.

#### • **Individuality**

Ralston and Breuer (1996) looked at the effect of feeding, across three winter months, a feed formulated specifically for old horses. They evaluated weight gain, body condition score (BCS) and various blood parameters in horses aged 20 or older at a large equine retirement facility. Half of the horses were fed a normal adult maintenance ration and the other half were given a product formulated for geriatric horses.

Horses and ponies with initial BCS of three or less in both groups were fed approximately 10 per cent more than the then National Research Council recommended energy requirements. The authors concluded “geriatric horses, especially those unable to maintain adequate weight on standard rations in the absence of hepatic or renal disease, appear to benefit from the special formulation”, but those that were able to maintain good condition on a conventional ration did not benefit in any way from such dietary intervention.

The study confirms the individuality of the older horse and the requirement to assess the needs of each horse based on current body condition, health status and activity.

#### • **Effect of dentition**

The presence of certain common dental abnormalities, such as points or hooks of less than 3mm in size, did not adversely affect digestion of nutrients in middle aged (10 to 15 years) horses (Ralston et al, 2001b) and may not affect faecal particle size or apparent digestibility of nutrients (Ralston et al, 2001a; Carmalt and Allen, 2008). However, both groups of researchers noted that extremely poor dentition might adversely impact feed intake and may contribute to weight loss through reduced feed intake.

Carmalt and Allen (2008) also speculated there may be a minimum amount of tooth necessary for effective mastication, but the morphological limit is currently unknown. In addition, evidence is available that age is associated with increasing severity of degenerative changes in the equine temporohyoid joint (Naylor et al, 2010), which may predispose horses to temporohyoid osteoarthropathy, which in turn may cause difficulty in chewing. Even if significant dental abnormalities are not present, periodontal disease (inflamed gums and buccal/lingual lesions) can be painful according to Carmalt and Allen (2008) and affected horses may demonstrate a reduced rate of feed intake (an issue with group feeding in particular), with partial or even complete anorexia reported (Knottenbelt, 2003).

More work is needed into the link between dentition, digestion and weight maintenance.

#### • **Feeding of alfalfa**

Feeding alfalfa to aged horses is controversial. It has been suggested alfalfa hay, with its higher leucine and crude protein content (compared to grass hay), may help to prevent loss of muscle mass in older horses, although no studies have tested this hypothesis.

However, if used as the sole or major source of roughage/ forage, alfalfa may promote the formation of calculi/enteroliths due to the high calcium plus protein content, and perhaps exacerbate renal and/or hepatic dysfunction (Ralston and Breuer, 1996). However, there may be some advantages to including a small amount of alfalfa in an older horse's diet where there is no renal or hepatic compromise.

#### • **Insulin resistance and age**

In humans, a progressive decrease in insulin sensitivity happens with age, and in a study (Rapson et al, 2011) – while no difference in the glycaemic response to a sweet feed meal was seen in association with age – healthy aged horses had a greater peak insulin concentration and area under the curve for insulin than adult horses, regardless of the background diet they had been fed for five weeks prior to the meal challenge. These animals were not obese, but it could be anticipated obese older horses may potentially suffer even more disturbance in their insulin responses. Again, further work is needed to determine how best to feed these animals prior to the development of this increased insulin resistance and in their old age.

## **Changes in nutritional requirements with age**

It is still not known in humans whether the elderly have different nutritional requirements from younger people. However, it is important to note even if energy expenditure and energy requirements decrease with age, requirements for the daily intake of many essential vitamins and minerals do not decline in proportion, and, therefore, the intake of these nutrients should at least meet normal maintenance amounts.

Similarly, a specially formulated diet may be indicated for horses with reduced caloric intake (for example, providing a palatable “balancer” product as a concentrated source of vitamins, amino acids and minerals).

As noted previously, aged horses may require higher energy intakes in cold weather because of their reduced thermoregulatory ability, but requirements will also be influenced by current body condition and level of activity. Old horses that are fat/obese should not necessarily be supplemented with extra energy sources just because it is cold.

Skeletal fragility, not associated with calcium deficits, has been reported in old horses with PPID (Dybdal, 1997). In an aged horse that is failing to maintain weight, is losing weight and/or has a unknown history with respect to parasite control, there may well be justification for a higher intake of protein and phosphorus (Ralston, 2006).

### • **Management considerations**

General management considerations in elderly horses (see also Jarvis et al, 2005; Jarvis 2009) include:

- provision of adequate shelter, but avoidance of prolonged confinement to stalls if possible;
- protection from extremes of environmental conditions;
- thorough, regular dental care and strict attention to control of internal parasites;
- clipping long hair coats in hot weather if necessary. If the horse has hypertrichosis, it will have increased sweat loss in warm weather and these animals should have free access to both water and salt;
- active strategies to ensure all-year-round adequate water intake;
- water and feed containers at an appropriate location and height to optimise access, especially if any arthritis is present in the neck;
- regular monitoring of bodyweight/condition. The amount of feed needs to be adjusted according to whether body condition loss or gain is required, with particular attention paid during extreme environmental conditions;
- choosing field companions carefully to avoid bullying;
- regular foot trimming and choosing a flat paddock, free from poaching and ruts, to decrease the strain on joints; and

– regular blood work/veterinary evaluations to detect onset of common disease/ageing infirmities.

### • **Nutritional considerations**

Old horses can perhaps be divided into four groups regarding their nutritional needs:

– **1.** The first concerns those that are maintaining good body condition, are clinically normal and “in use”, that is, the horse that is old in years but has no apparent age-related or clinically important disorders and is still being used for performance and/or reproduction. Such horses can maintain optimal bodyweight and condition on a standard “adult” ration formulated for their level of activity and reproductive status.

The **nutritional advice** for this group is to continue on the current management regimen, assuming it is balanced for a horse’s needs, but continue to monitor weight and to maintain routine vaccination, dental and parasite control programmes.

– **2.** The second group covers overweight/obese, but clinically normal, horses, that is those old in years and still functioning normally, but with a reduced level of physical activity and a tendency to gain weight.

Regarding **nutritional advice**, it would seem on the face of it even more important to prevent the older horse from being overweight than its younger colleague – but practically this has to be balanced with the often increased difficulties of maintaining bodyweight of older horses during the winter – especially when they have dental issues. For many older horses, especially if they are not prone to laminitis, having them in a slightly higher body condition (perhaps 6-7/9) just prior to entering the winter period may be the preferred option. However, this does need to be proven.

If horses are especially overweight/ obese coming out of winter, consider implementing management practices for weight loss. Continue to monitor weight and to maintain routine vaccination, dental and parasite control programmes.

– **3.** Those with difficulty in maintaining weight but that are clinically normal fall in the third group. This group features horses old in years that are clinically normal, but no longer able to maintain weight on a normal diet.

As far as **nutritional advice** is concerned, confirm that teeth and parasite control programmes are adequate and that hepatic and renal functions are within normal limits. Gradually change to a more calorie and nutrient-rich diet. However, the author’s advice would be to try to obtain any increase in BCS through the use of meals that promote low (or low/moderate) insulin responses. These include:

– Considering the use of more digestible forage (such as less mature grass hay).

- Considering including highly digestible fibre sources such as unmolassed sugar beet pulp or soya hulls as a means to increase the energy intake if required without using starch or sugar. Especially for horses prone to laminitis, the author recommends soaking and throwing away the water even from unmolassed sugar beet pulp. This reduces the watersoluble carbohydrate (WSC) and fructose content.
- If no contraindications are visible, consider using oil as an energy source rather than cereal starch. This should be considered especially for animals not being exercised (remember to add gradually, balance the overall diet and add additional vitamin E at 100IU to 150IU/100ml of oil). Not more than 1.0ml oil/kg bodyweight should be added unless advice has been obtained from an appropriately qualified nutritionist or veterinarian.
- If any cereals other than oats, are fed ensuring they are processed by cooking (for example, steam flaking, micronising) to make the starch more easily digested, reducing the risk of starch overload.
- Avoiding feeding large grainbased meals. Meal sizes should be restricted to lower than 0.3kg/100kg bodyweight of a cereal-based feed. For all horses, ensure overall starch intake is lower than 1.0g starch/ kg bodyweight per meal.
- Ensuring any meal/forage fed is, ideally, sufficiently small in size and low in starch/ sugar content that it only produces a low/low to moderate insulin response.
- Noting that for many older horses with poor dentition, access to grazing seems to be the most consistent way to promote a good body condition during the late summer/autumn in preparation for winter.

Commercial feeds designed to prevent weight loss and restore optimal condition in older horses are now commonly available. These should provide good quality (amino acid profile) protein (10 per cent to 14 per cent with soybean meal or legumes, for example, as the main sources), added oil (five per cent to 10 per cent), plus calcium monophosphide (Ca/P) contents to enable a slightly restricted calcium and slightly increased phosphorus overall intake.

- **4.** The fourth group concerns the truly geriatric horse, which has one or more physical or metabolic abnormalities in addition to old age. This group's **nutritional advice** includes to provide treatment and support for some specific underlying conditions. It may not be possible to address all the issues in such horses adequately. It is better to feed something that reasonably meets the horse's nutritional needs and that it will consume voluntarily than to feed a ration it will not consume.

If a horse has clinical evidence of PPID but has not had laminitic episodes, it may be possible to maintain it on good quality forage (pasture and/or hays) with the addition of a reduced starch/sugar

adult or “senior” product with additional digestible fibre or oil supplementation, if necessary, to maintain or increase body weight/condition.

If horses or ponies have experienced repeated episodes of laminitis, it is recommended to analyse the forage and to feed one with lower than 12 per cent non-structural carbohydrate (starch, sugar and fructan) content. Many hays will be higher than this. Soaking grass hay in clean water (more than 8°C, for winter tap water, and ideally around 16°C, for summer tap water) for at least three hours may help to reduce the WSC content (Longland et al, 2010 and 2011). However, as the results from soaking are variable it is advisable, if concerned, to ensure the original forage has a low non-structural carbohydrate (NSC) content or that an appropriate forage replacer is fed. Obviously, reducing the WSC content will reduce the energy content of the hay and this needs to be taken into consideration, as many PPID horses show weight loss.

A broad-spectrum vitamin, amino acid and mineral supplement should be fed if reduced levels of hard feed are given (or forage is the main component of the diet). Ensure an adequate and balanced intake of magnesium. No published scientific evidence is available, however, to suggest high levels of magnesium will be protective and reduce the risk of laminitis or PPID.

Old horses with PPID have been documented to have higher faecal gastrointestinal parasite egg counts than healthy age-matched controls or younger animals (McFarlane et al, 2010). Heavy intestinal parasite burdens may, therefore, contribute to weight loss in these animals and the implementation of a more rigorous anthelmintic treatment regimen may be indicated in these circumstances.

## **Horses with inadequate dentition**

- For all old horses, even those with severely compromised dentition, the ration should be based on forage/ high-fibre feeds (as for all horses).
- Unless choke is a problem, hay, preferably a high-quality grass or grass/legume mix, can be offered free choice. However, these animals may not be able to adequately masticate long stem, especially mature hays.
- When available, and if laminitis is not an issue, pasture turnout may be the most appropriate forage source, as grass appears to require less mastication than dried long stem forages and is usually an excellent source of most of the nutrients required by healthy aged horses not in active work (an appropriate “balancer” should be fed to ensure overall nutrition).
- Alternatively, chopped hays or haylages, beet pulp or hay/ grass cubes divided into at least two or, preferably, three feedings per day (offering at least 1.5 per cent to two per cent bodyweight in dry feed weight overall) can be used. Processed fibre and nutrient sources, especially the latter two, can be soaked in water to reduce the risk of choke and increase water intake.



Pelleted or extruded “complete” feeds may also be used, especially for horses that have little or no ability to masticate even chopped hays adequately. Again, these should also be soaked in water to reduce the risk of choke, and offered in limited amounts (0.1 per cent to 0.5 per cent bodyweight) per feeding to prevent spoilage and maximise intake. Additional vegetable oil (added gradually and not more than 1.0ml/kg bodyweight without additional nutritional advice) can be added if required (and if clinically appropriate) to help maintain weight.

- Whole grains and even processed grain mixes may not be suitable for horses with severe dental abnormalities.

## **Possible additional nutritional support**

### **• Vitamins and other antioxidants**

The incidence of recurrent airway obstruction (RAO) or chronic obstructive pulmonary disease (COPD, also known as heaves) increases with age in horses, and the concentration of ascorbic acid in plasma and pulmonary epithelial lining is significantly reduced in RAOaffected horses – in both crisis and remission – compared to healthy control animals (Deaton et al, 2004).

It has been postulated that specific targeted dietary antioxidant supplementation may be of benefit in horses prone to RAO, as well as potentially to stabled horses in general (Deaton et al, 2002 and 2005; Kirshvink et al, 2002). One study reported lower plasma vitamin C in old horses when compared to younger animals fed the same feed and housed under the same conditions (Ralston et al, 1988).

Vitamin C supplementation (0.02g ascorbic acid/kg bodyweight twice a day) has been observed to increase antibody response to vaccine administration in aged horses (Ralston and Dimock, 2000, unpublished data), and administration may help if chronic infections are a problem (Ralston, personal observations). Obviously, further work is needed to confirm this. However, it is important to note current recommendation that vitamin C supplementation should not be stopped abruptly, but instead tapered off slowly over the course of a week or so.

A study suggested vitamin E status may be associated with immune function and quality of life in elderly people (Capuron et al, 2009). A study suggested there was a significant decrease in IFN and TNF $\alpha$  production in Resveratrol (2000mg/day) supplemented aged horses post-four weeks supplementation compared to non-supplemented control horses. Interestingly, an increase in neutrophil reactive oxygen species activity in the resveratrol group was reported, which might be advantageous (Adams et al, 2010).

In older people, it has been suggested micronutrient deficiencies are common and supplementation appears to be of benefit (Lesourd and Mazari, 1999; Chandra, 2002). It has been suggested the nutrient recommendations should be increased (in particular for vitamins B6, B12, C, D and E, folic

acid, beta-carotene and zinc) in the elderly, for a number of reasons. Whether this is true for the horse is unknown, although over-supplementation with trace minerals, such as chromium and zinc, may be detrimental to immune function.

The author's current practical recommendation is to maintain the vitamin and micronutrient intake at least at recommended maintenance levels, and perhaps more optimally at the levels typically recommended for exercising animals.

#### • Joint support

A variety of nutraceutical products are on the market, targeted at the management of lameness, related to osteoarthritis. Although anecdotal reports exist about the efficacy of these products, in the author's opinion a lack of published clinical trials exists in the older horse.

## Conclusion

Treating horses as individuals as they age and providing them with targeted nutrition, and appropriate management as well as veterinary attention will help to support them to have as healthy and active a life as possible.

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