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SPORT HORSE NUTRITION—AN AUSTRALIAN PERSPECTIVE

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Introduction

To perform at Olympic-caliber competitions, horses must consistently maintain a level of athletic performance that strains their muscular, skeletal, and digestive systems. As the consulting nutritionist to the Australian Equestrian Team, I am primarily concerned with the nutritional challenges of our equine athletes. Much of the equine nutritional research and product development effort is directed at the racing industry, and while this information is useful, it is worth remembering that an elite performance horse is much different than a Thoroughbred racehorse. Moreover, each Olympic discipline attracts horses of different types, workloads, training programs, and feeding practices.

An extensive evaluation of feeding and work practices of members of Australia's equestrian team was conducted over a two-year period. The daily workloads, actual body weights, feed intakes, and feed analyses were ascertained for 22 elite horses, consisting of eventers, show jumpers, and dressage horses. Horses were evaluated for five consecutive days. All of the horses studied were stabled at night with limited or no access to pasture during the day.

The ultimate goal of this study was to ensure that the performances of Australia's equine athletes, both within and outside Australia, was not limited by suboptimal nutrition. To attain this goal, it was important to quantify the variation in standard nutritional parameters for each discipline and to understand the "hot buttons" for riders in the different disciplines.

This paper summarizes some of the outcomes from that feeding evaluation and provides some insight into current feeding practices of sport horses in Australia.

Daily Feed Intake

During the study, each horse was weighed at the same time each day using portable Tru-test scales, and every ingredient in each meal was weighed over a five-day period. Rejected feed was recorded and samples retained for analysis. Table 1 summarizes the average body weight and DM (dry matter) feed intake for all horses in each of the disciplines. In this evaluation, the eventing horses consumed

an average of between 1.48 and 2.45% of body weight. The dressage horses consumed between 1.04 and 1.79% of body weight and the show jumpers between 1.09 and 2.55%. Recommendations by the NRC (1989) suggest daily feed intakes for working horses to be between 2 and 3% of body weight.

Table 1. Average daily intake of DM as a percentage of body weight (BWT) by discipline.

Discipline	*Body weight*	*% of BWT as DM intake*
Show jumpers	487.0	1.98
	493.3	1.17
	506.8	1.09
	514.8	2.08
	542.5	2.55
Dressage horses	533.2	1.36
	570.4	1.69
	608.0	1.79
	646.0	1.48
	657.6	1.04
	759.2	1.20
Eventers	483.4	2.12
	498.4	1.91
	502.8	2.05
	517.6	1.91
	529.2	2.45
	539.2	1.75
	546.8	1.48
	558.4	1.76
	582.0	1.76
	587.6	2.02
	615.6	1.63

In a study of 25 Thoroughbred and Standardbred racing stables in 1993, Southwood et al. found that the feed intake of the Thoroughbreds and Standardbreds studied was similar to NRC published requirements. In this study, the horse's body weight was estimated using the formula from Carroll and Huntington (1988), and the feed intake was recorded for only a single day. The results shown in Table 1 show less consistent agreement with NRC recommendations for feed intake and highlight the individuality of horses in their feed consumption and the importance of considering existing patterns of feed intake when recommending a diet change.

Results from this evaluation suggest that dressage horses in full work might be expected to consume between 1 and 2% of body weight, while eventers and show

jumpers may consume between 1 and 2.75% of body weight. These results illustrate how important it is for each horse to be fed as an individual and why it is sometimes necessary to be critical of feed manufacturers' recommendations for feed allowances. Such feed intake allowances are frequently based on surveys done with racehorses, and direct application of the allowances to performance horses could result in unwanted weight gain and/or other undesirable side effects, such as colic, heat bumps, and behavioral modifications.

Body Weight

Variation in body weight of horses in the three disciplines is summarized in Figures 1, 2, and 3. Predictably, the dressage horses were the largest with average body weights between 533 and 759 kg. Four out of five of these horses were full or part warmblood, and as a group recorded the least variable body weights over the five-day evaluation period. This reflects the consistent pattern and intensity of work employed with these horses.

The eventers (all Thoroughbreds) had a standard deviation for body weight change over the five-day study period of between 1.673 and 10.64 kg. A change of 22 kg was recorded for one horse between a day of gallop work and a day of flat work when the horse was accidentally denied access to water.

The greatest daily change in body weight was reflected in the show jumpers that were either Thoroughbreds or Thoroughbred/warmblood crosses. This may be explained by two factors. Firstly, one group of horses had recently returned from a short layoff, so some of the variation could be explained through adaptation to higher energy diets following a week of fiber-based rations. Secondly, both groups of horses studied were fed hay by volume from variable-quality hay, which contributed to fluctuations in daily intakes of fiber by weight.

Generally, riders are not aware of the actual weights of their horses, nor the normal range for variation of those body weights in response to work intensity, climate, or feed changes. The three eventing horses that were fed four times daily and were most closely supervised by their riders showed the lowest daily variation in body weight of all the eventers and show jumpers.

Feed Ingredients and Analyses

There was a heavy reliance on roughage sources to provide macro- and microminerals. All horses were fed chaff with their concentrate meals. Both white and green chaffs were used. White chaff was either oaten or wheaten hay steam cut to 1 cm, and green chaff was lucerne steam cut to between 1 and 3 cm. Lucerne and grass hays were also fed in hay nets at night and/or on the ground during the day in the yards. The majority of horses received the appropriate amount of roughage in their diet (between 40 and 50%), but there was considerable daily variation as a result of the hay being fed by volume rather than by weight.

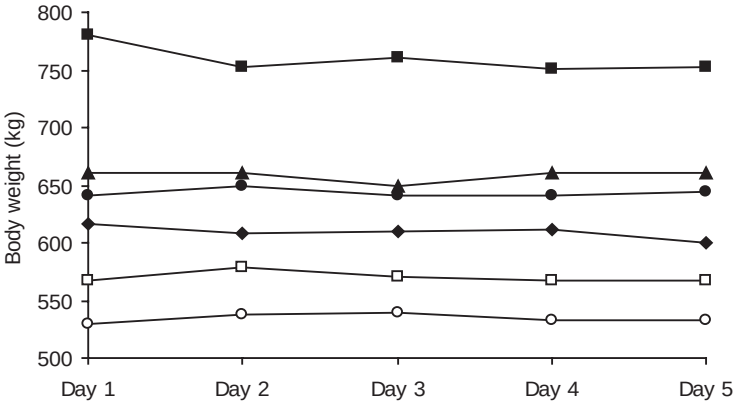

Figure 1. Daily body weight variation of dressage horses.

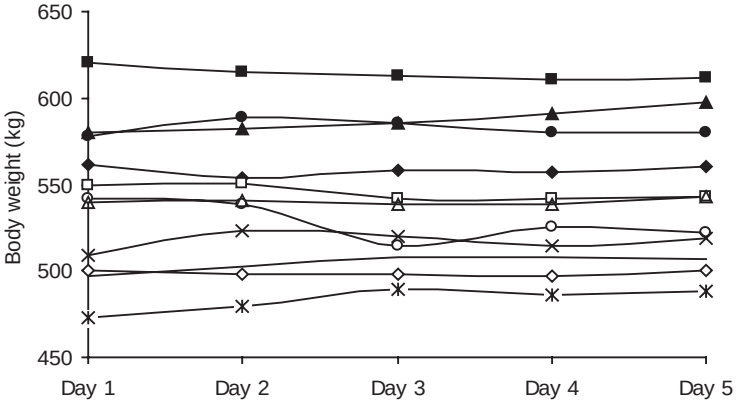

Figure 2. Daily body weight variation of eventers.

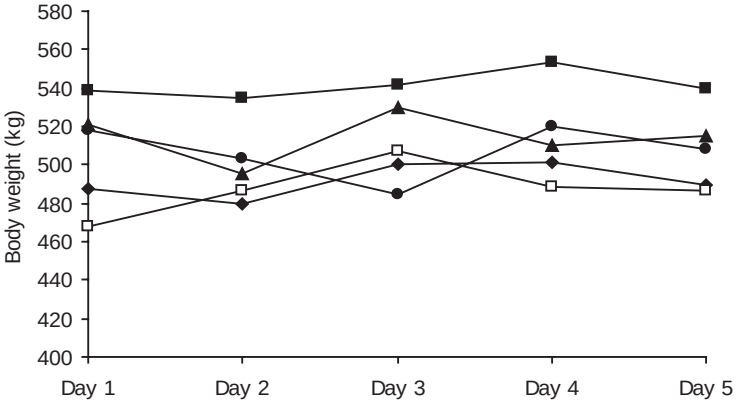

Figure 3. Daily body weight variation of show jumpers.

Lucerne is a source of calcium, but analysis of lucerne hays and chaffs used by participants in this evaluation showed that the calcium level varied from 0.67 to 1.75%. The iron content in one sample was 65 ppm, which is considerably less than the stated level of 225 ppm in the NRC. These results suggest that riders naively believe that the roughage will provide an adequate source of all major minerals for their horses. There is a need for an accurate and reproducible method for determining the digestible energy (DE) composition of feeds, both raw materials and compound feeds. Using the DHIA Laboratory in Ithaca, New York and the prediction equation of Pagan (1986), it was found that the estimated DE for a commercial extruded feed was only 12.86 MJ/kg versus a label claim of 16.9 MJ/kg. This is a source of inaccuracy and misinformation for riders, veterinarians, and nutritionists trying to formulate balanced and appropriate rations for sport horses.

The majority of the dressage and eventing horses were fed home-mixed diets (grain-based) without inclusion of any fortification pellet or sweet feed. Three eventing horses were fed a fortified sweet feed, and the balance of the horses (show jumpers, eventers, and one dressage horse) received a pellet in conjunction with other diet components.

Some riders were feeding seaweed meal or liquid sea minerals in the belief that these products provided an adequate source of essential minerals for a working horse.

Dietary Deficiencies

Raw materials were analyzed by the laboratory at the University of New England and the DHIA Laboratory, and DE was estimated using the equation from Pagan (1986). Declared nutrient levels were used for proprietary feeds and supplements. Data from the NRC (1989) were used for the balance of nutrient data for each of the ingredients to produce an estimate of nutrient intake for each day of the evaluation. This information was then compared against predicted requirements gathered from Kentucky Equine Research's MicroSteed program and the NRC (1989) for mature horses in work. The requirements used were aimed at optimizing performance rather than preventing deficiency and are therefore higher than published data that addresses minimum requirements. Of the 22 horses studied, only one eventer and three dressage horses received no additional vitamin/trace mineral supplementation from either supplements or fortified feeds. Overall, 17 of the 22 horses were receiving suboptimal levels of vitamin E, less than 1000 IU/day. Nine horses received intakes far below those recommended for sodium, and four were deficient in minor vitamins. All horses appeared to receive adequate calcium, phosphorus, magnesium, potassium, iron, and cobalt.

Feeding Practices and Management

FEEDING FREQUENCY

Of the horses studied, 15 were fed twice a day, three were fed three times a day, and four were fed four times a day. Under free-range conditions, a horse will graze between 50 and 70% of the time, ensuring a continuous intake of small amounts of grass. Restriction to twice-daily feeding increases the likelihood of colic, possibly affecting gastrointestinal tract distention, motility, and blood flow. There is a concurrent alteration in metabolic rate, circulation and concentration of cortisol, and concentrations of electrolytes.

To prevent digestion dysfunction (excessive gas production, colic, laminitis, and impaired fiber digestion) resulting from starch overload, grain intake in horses fed two or three times daily should be limited to 0.5 kg of grain per 100 kg of body weight. Most riders were aware of these potential problems but were unable or unwilling to modify current feeding management practices to cater to the idiosyncrasies of their horses' digestive systems. Three of the eventers consumed a grain portion well in excess of this recommended maximum, thus increasing the risk of colic in these animals.

By contrast, four of the eventers were subjected to increased feeding frequency and more personal supervision of their feeding management, resulting in these horses having the lowest variation in digestible energy intake and body weight.

FEEDING PRACTICES

In Australia, it is not common practice to wet hay. In this study, none of the participants soaked hay and usually only the night feed was dampened with molasses water. Two eventers were fed a wet feed once a week. It was into this feed only that the vitamin/mineral supplements were added. All feeds were mixed by volume, but one rider did weigh the horses' rations on a weekly basis and adjusted the volume-mix charts accordingly.

Most members of the elite equestrian squads in Australia are professional riders who are required to work a team of horses each day and combine teaching and training to supplement their incomes. This necessitates the employment of staff to supervise the daily management of their horses. As a result, the riders forfeit the intimate knowledge of their horses' feeding to their staff.

During this study, I discovered instances where riders were ignorant of their horses' level of feed intake and/or rejection and were unaware that certain ingredients were being excluded from the diet, due either to lack of availability or grooms who simply forgot to include that ingredient. Feeds prepared for one horse were mistakenly fed to another, and in a case already described, a horse was accidentally denied access to water because of staff negligence. These instances

should not be viewed as the norm, but indicate that the nutritional adequacy of some Australian sport horses is compromised because riders do not believe that nutrition is worthy of their personal interest or attention.

NUTRITIONAL UNDERSTANDING

While some of the participants had a clear grasp of the principles of basic equine nutrition, several were confused about feeding and viewed nutrition as a low priority in the performance of their horses.

One rider who had been consistently advised against feeding large amounts of pollard (wheat bran) continued to do so because he had not detected any negative impact from this practice. By comparison, another rider adhered to the very best feeding practices and had previously utilized the services of a nutritionist to evaluate the nutritional adequacy of his feeding program.

The fact that the participants allowed the evaluation to be carried out at their stables demonstrated that they are willing to learn about nutrition. Without exception, the riders were interested in the outcome of the evaluation and the suggested diets that were provided.

Hot Buttons

It can be very dangerous to make generalizations about the feed preferences that riders in different disciplines have for their equine partners. For instance, it is commonly assumed that, because the majority of dressage competitors are female and that the horses are large warmbloods, a "non-heating" diet is preferred since the riders could not control such a big animal otherwise. While this may be the case for many hobbyists, riders at an elite level need a horse that is extremely fit. Long-term soundness, prevention of muscle soreness, and endurance to produce a top-level performance over three days of competition are the major goals.

Show jumpers do relatively little work compared to dressage horses or eventers–both in training and during competition–so feeding strategies need to be aimed at high energy for short duration work, body weight control, and soundness of legs and head.

All top-level horses spend months each year traveling and competing under stressful conditions. Highly palatable feeds that the horse will consistently clean up are of primary concern. Soundness and prevention of muscle damage is crucial. As the value of the animal increases, veterinary intervention to oversee such conditions may take precedence over nutritional solutions.

Lack of knowledge leads to the use of unproven herbal, homeopathic, medicinal, or other dubious alternatives for the treatment of performance-limiting conditions such as muscle soreness, mental tenseness, lameness, low feed intake, or respiratory disorders. Riders are often reluctant to share these "cures" with professionals

charged with supervising the health of their horses. It should also be remembered that it is not always the rider who does the feeding; rather, the groom or head girl is frequently the individual overseeing the animals' daily feeding and management routines.

Ingrained, inappropriate feeding practices persist even among elite competitors. Quite often the lack of a problem is the greatest hindrance to improving feeding practices and nutrition of sport horses.

Conclusion

Australia continues to dominate international three-day events, having won three consecutive team gold medals in Olympic competition. At the Sydney Olympics, Australia also demonstrated improving competitiveness in dressage and show jumping. Sport horses are an important part of the Australian equine industry and meeting their nutritional requirements with a cost-effective diet that recognizes the limitations of ingrained feeding practices is a challenge.

In order to formulate a balanced ration for sporting horses today, we are faced with the dilemma of deciding what to measure, against which standards, and using what resources? Consistent, reproducible laboratory tests for DE determination of feedstuffs and finished feeds must be established in Australia and implemented by the major feed manufacturing companies. NRC figures, last published in 1989, do not take into sufficient consideration variations in workloads, feeding practices, or breed differences and address minimal, rather than optimal, nutritional requirements for performance. Actual body weights and weights of individual feed ingredients are a minimal requirement in any nutritional evaluation. Riders rarely take the time to measure these parameters themselves and in some cases cannot be relied upon to give an accurate record of a horse's feed status. Professionals who cater to riders of eventing horses need to be aware of the differences in both requirements and feeding practices of elite sport horses versus Thoroughbreds and/or Standardbreds.

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