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Feeding Management of the Three-Day Event Horse

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INTRODUCTION

The main goal of feeding a top-level three-day event horse is to deliver nutrients in optimal amounts using sound feeding management practices that allow the horse to maximize its performance. The 2007 edition of the National Research Council's (NRC) *Nutrient Requirements of Horses* provides nutritional recommendations for all classes of horses, including those trained and competed at high levels of competition. The NRC identifies four levels of activity: light (recreational riding or occasional showing), moderate (school horses or frequent showing), heavy (polo, ranch work, or low-level eventing), and very heavy (racing, endurance, or elite-level eventing). Horses in the "very heavy" activity level, like three-day event horses, often have energy, protein, vitamin, and mineral requirements 1.5 to 2.0 times their requirement for maintenance (NRC, 2007).

The main component of any horse's diet should be forage, but three-day event horses require supplementation to the diet to meet increased nutrient demands due to training and competition. The basic principle of supplementation is to give a horse one or more dietary ingredients above what is normally required to meet nutrient requirements. However, supplements are also given with the goal of improving performance, preventing a problem from occurring, and combating or managing a problem after it arises. Supplementation usually occurs in the form of feeding concentrate, dietary ingredients including bran and oats, or nutrients including vitamins, minerals, or fat. Many commercial supplements contain ingredients that provide one or more vitamins, minerals, amino acids (protein), fuel sources (carbohydrates and fats), herbs, and direct-fed microbials (bacteria and yeast). In 1998, it was estimated that 94.4% of horse operations surveyed in the United States fed a grain or concentrate to their horses and that 69.8% of those operations also fed supplements (USDA, 1998).

Nutrition Basics

No matter what the specific subject, when writing any nutrition paper you can't start without mentioning forage as a part of the horses' dietary requirements. It doesn't matter what the discipline or breed, all horses should consume at least half of their diet as forage (hay, pasture, and other processed forage). Good-quality grass hay is best for the mature exercising horse; however, young growing horses whether in training or not should have a mixed grass/legume hay or the addition of an alfalfa product to their meals. This will increase the amount of protein in the diet along with calcium, phosphorus, and other nutrients. The typical recommendation is that horses eat 2 to 2.5% of their body weight in dry matter (feedstuffs minus the water content). If feeding a strictly hay diet, a horse would need to consume about 20 pounds for a 1000-pound horse. Exercising horses that are fed hay in a stall could be fed

free-choice with the grain meals making up the remaining calories. If factoring in pasture, you have to take into account the high water content, but if grazing for 24 hours a day without other feedstuffs, that 1000-pound horse would naturally consume between 2 and 3.5% of its body weight in pasture (without the water). Feeding to maintain an appropriate body condition is the best way to go about figuring out the correct amount of feed. However, if horses need more weight, the first place to start increasing is the amount of forage, before considering adding more grain.

Energy Consumption

Exercising horses need proper amounts of energy to be able to maintain their weight while having sufficient energy to perform to the level of training asked of them. However, sometimes that requires adding large amounts of grain, possibly in excess of 8 to 10 pounds per day. This amount of sweet feed, if it is carbohydrate- or starch-based, could potentially cause metabolic problems like colic and gastric ulcers (Clarke et al., 1990). It is recommended to back down on the amount of sweet feed given daily but maintain the caloric intake by adding fat to the diet. Horses can process up to 20% fat in their total diet, and much of that is used for slow breakdown into energy (not explosive as starches and sugars could do).

Adding vegetable oil products or rice bran is the best way to increase the fat content of the diet. Up to two cups of corn oil would be appropriate for a horse in heavy to very heavy exercise, as with three-day event horses. Rice bran is good for the finicky horse that doesn't like the oily mess; however, it also has a large amount of fiber so you would need to add much more than the two cups of oil (one to three pounds would be more appropriate). Any of these changes can upset the diet's balance of other nutrients, so it is advisable to check with an equine nutritionist along the way.

Dietary Management of Top-Level Event Horses

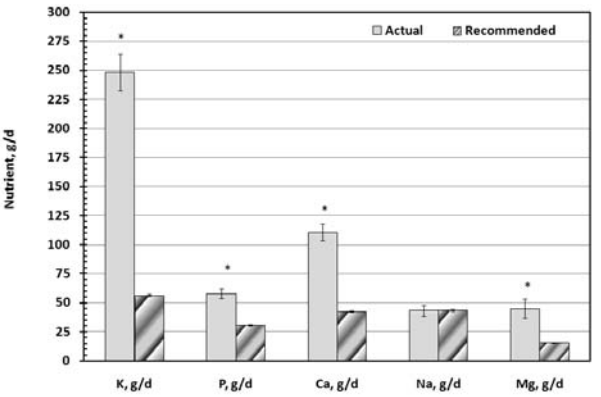
Recently studies have been done to measure the feeding practices of top three-day event horses. These studies have been performed to estimate intake levels of various nutrients and determine supplementation use in the industry. The following portion of this paper will provide some of the results found in these recent three-day event horse studies. For more complete results and discussion, see Burk and Williams (2008) and Williams and Burk (2010).

Forage and grain intake

One study surveyed riders competing in the 2006 and 2007 Jersey Fresh CCI** and CCI*** Three-Day Event (Allentown, NJ, USA) as to their feeding management practices leading up to and at the competition (Burk and Williams, 2008). The horses participating in this study were considered to be in "very heavy" work before and during the competition under NRC (2007) guidelines. In order to meet nutritional requirements, the majority of horses were fed a daily ration consisting of limited grass pasture, grass hay or a mixed grass/alfalfa hay, a commercial feed product, and salt and/or one or more commercial supplement products. Whether all horses were fed to meet their nutrient requirements was not

determined in this study; however, it was determined that total daily intake of forage and concentrate fed at the 2007 competition was 21% and 3% above NRC (2007) recommendations (as-fed), respectively. In a subsequent study, however, intakes of vitamin E and various minerals were determined and compared to NRC (2007) recommendations (Williams and Burk, 2010). This study found actual daily intakes of potassium (fourfold), phosphorus (twofold), calcium (twofold), and magnesium (threefold) were higher than NRC (2007) recommended levels for horses of similar body weight in "very heavy" exercise (Figure 1). Actual intake of vitamin E was also higher than recommended intakes by about 50%. There was no difference between actual and recommended levels of sodium, but this was not taking into account free-choice salt consumption.

*Figure 1. Actual and recommended (NRC, 2007) daily intakes of potassium (K), phosphorus (P), calcium (Ca), sodium (Na), and magnesium (Mg) for horses competing in the 2007 Jersey Fresh CCI**/CCI*** three-day event. *Denotes difference between actual and recommended intakes (P < 0.001). (Reprinted with permission from Williams and Burk, 2010)*



A large percentage of the horses had their daily ration divided into smaller meals fed two or more times per day. The majority of horses in this study were meeting minimum forage intake recommendations of 1.0% body weight (Geor, 2008). Riders who fed a mixed grass/alfalfa hay were likely adding 0.1-0.2 Mcal DE/kg more to the diet than if feeding a grass hay, which is a useful way to increase the amount of digestible energy and nutrients fed while lowering the amount of concentrate needed (Burk and Williams, 2008). Nearly all of the horses were fed a commercial concentrate. Feeding concentrates with starch levels less than 0.4% of body weight or in total amounts less than 5.5 pounds is recommended to reduce the risk of digestive upsets (Clark et al., 1990; Potter et al., 1992) and metabolic disorders such as exertional rhabdomyolysis (McKenzie et al., 2003). Despite that recommendation, we still observed a small number of horses in the 2007 CCI** (20%) and CCI*** (16%) divisions that were fed more than the recommended amount of concentrate per meal. It is apparent that at this level of competition, horses are receiving large concentrate meals that should be divided into three or more meals per day.

Supplement use

On average, riders in our study fed four oral supplement products or feed ingredients in addition to the horse's daily hay and concentrate ration (Burk and Williams, 2008). Total supplement use over the 2006 and 2007 Jersey Fresh CCI** and CCI*** Three-Day Event is illustrated in Figure 2. Riders appeared most concerned about electrolyte balance as well as preventing or combating problems associated with joints. Supplementation with electrolytes to elite equine athletes is recommended to help replace those lost in sweat during acute exercise (Ecker et al., 1995; McCutcheon et al., 1995; Hyyppa et al., 1996). Many of the riders surveyed fed electrolytes on a daily basis rather than in response to exercise level or ambient temperature. In addition to the daily electrolytes, many riders also fed salt granules or blocks that added additional sodium and chloride to the horse's diet. Daily electrolyte supplementation may create nutrient excesses that may ultimately negatively impact the horse, and nutrient excesses lost in the urine and feces will negatively impact the environment. As shown with the subsequent study estimating daily mineral intake levels two- to fourfold higher than NRC (2007) recommended intakes could have been the result of daily electrolyte supplementation (Williams and Burk, 2010).

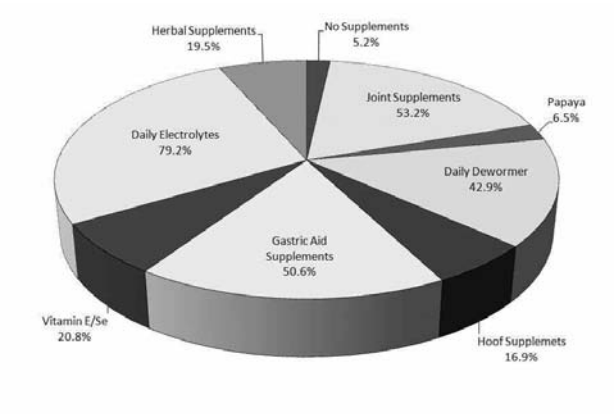


*Figure 2. Percent of riders participating in the 2006 and 2007 Jersey Fresh CCI**/CCI*** three-day event feed management study who fed supplements to their horses (n = 77).*

Oral joint products were also one of the most common supplements in top-level three-day event horses (Burk and Williams, 2008). Oral joint products are theorized to provide extra building blocks for joint components and to reduce inflammation; however, research in horses is scant and inconclusive (Goodrich and Nixon, 2006). Compounds that are fed to horses to either treat or prevent joint disorders should be shown effective in clinical trials, and the manufacturer that markets the compounds as products should have a demonstrated record of good quality control.

Feeding practices before and after cross-country

Feeding management of horses was quite varied prior to the start of the cross-country phase of the three-day events. While the majority of horses had no change in their diet, many had a reduction in hay, grain, or both prior to cross-country (Burk and Williams, 2008). A reduction or elimination of forage from the diet 3 to 5 hours prior to an exercise bout may be an advantage due to a reduction in weight in the bowel (Meyer, 1995) and in cardiovascular load during exercise (Duren et al., 1992). Several studies found that feeding small amounts of hay prior to exercise was not associated with poor performance, but concentrate should be reduced (Duren et al., 1992; Pagan and Harris, 1999). A reduction in concentrate is often recommended 3 to 5 hours out from an acute exercise bout to allow metabolites to return to resting values following meal consumption (Duren et al., 1999; Pagan and Harris, 1999).

The goal of feeding after cross-country should be to replenish nutrients and energy reserves. Most of the horses in our study were fed their normal ration between 1 and 4 hours after cross-country. Given that the feeding of hay and concentrate, rather than hay alone, after intense exercise was associated with higher muscle glycogen stores (Lacombe et al., 2004), a reduction in hay, concentrate, or both after cross-country would not be recommended. There were some horses that received electrolytes and/or a bran mash following cross-country (Burk and Williams, 2003). The addition of a bran mash after cross-country was likely a technique to help with hydration, but the rationale behind that practice is not known nor has it been researched.

Study conclusions

This previous study presents the feeding management practices and supplement use in three-day event horses competing in the Jersey Fresh CCI** and CCI***Three-Day Event that are deemed important by the riders to their competition success (Burk and Williams, 2008). While the majority of feeding management practices followed research-driven recommendations, others did not. Horses in this study were more than likely being fed to meet their nutritional requirements given the amount of feed offered, the high rate of horses successfully completing the competition, and the optimal body condition score at which the horses were maintained. However, the relatively high average supplement use of four supplements per horse raises the question about oversupplementation in these horses, which was evident in another study looking at the same horses (Williams and Burk, 2010). Lastly, this study demonstrates the nutritional challenges faced by this subset of three-day event riders given the variety of factors associated with these competitions, including transport, housing, exercise level, and general stress.

Take-Home Message

With the high levels of energy three-day event horses are expending, it is important to feed the right balance of forage along with high-energy feeds. Extra vitamin and mineral supplementation may be necessary, but caution is needed to make sure that oversupplementation does not occur. Working with a nutritionist is recommended for horses that are on the fine line of nutrient balance.

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