

# Experiences From International Competition

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## Background

Through my involvement with research into thermoregulation in relation to the Atlanta Olympic Games, with the British Three-Day Event, Showjumping, Dressage and Endurance Teams in my role as Sports Science Advisor and as an exercise physiologist for a leading racehorse trainer in the United Kingdom, I have been fortunate to have worked with a number of elite equine athletes and world class riders, and attend a number of international level competitions. My involvement with the British Teams has ranged from education programmes for riders, grooms, team managers and veterinarians to clinical exercise testing in the field and on the treadmill, travelling with horses to competitions and input into areas such as training programmes and competition strategy. In this talk I will relate some of my experiences.

## General Management

All riders competing at international level will undoubtedly have attained a high degree of competence in their sport. This does not mean that there is not likely to be any room for improvement. Successful competition at the highest level must involve attention to detail in all areas of management. Whilst adequate but less than optimal management, including factors such as nutrition, training, fitness and sub-clinical disease or injury may not have an obvious detrimental effect on performance at national level, the effects of transport, acclimatisation, changes in diet, water source, separation anxiety from stable companions, disturbance of routine, and an increased level of competition are likely to have a more obvious effect on performance when combined.

## Diet

In our experience, riders may have a limited knowledge of nutrition. Nutrition is potentially a complex area and enlisting the help of a qualified and experienced equine nutritionist should seriously be considered when evaluating equine diets for horses competing at the highest level. Feed companies are in the business of selling feed and some companies do this as if selling double-glazing with spectacular, inaccurate and sometimes deliberately misleading claims. Some examples of problems that we have encountered with the diets of elite horses include: (1) a rider who had been told that eggs were good for horses and was feeding around 24 eggs a day which resulted in a severe electrolyte disturbances; (2) a trainer who had been told that an extra source of dietary vitamin C was good and was feeding such large amounts that all the horses in his care had marked acid-base disturbances; (3) a rider who was persuaded to change from feeding complete oats to feeding naked oats. Unfortunately, no one pointed out to him that a scoop of naked oats was not equivalent to a scoop of straight oats. The result was overweight horses that lost exercise tolerance. (4) Iron overload and iron toxicity due to excessive iron supplementation in a horse with plasma iron levels four times greater than normal. Interestingly, in one international Great Britain team we found all horses were over-supplemented with iron. (5) Excessive feeding of oil leading to very loose droppings and reduced electrolyte absorption.

Recommendations for feeding electrolytes are often based on animals in moderate work in temperate environmental conditions. Add in to the equation variation in the efficiency of absorption between animals and a diet that might be considered adequate may well result in some animals being grossly under-supplemented and other grossly over-supplemented, especially for electrolytes such as calcium. Our approach with team horses has always been to carry out a urinary creatinine clearance and adjust the diet electrolyte content accordingly. This may sometimes be reflected in reduce plasma CK/AST activities following exercise/competition.

## Transport

One of the most serious consequences of prolonged transport for health is the potential development of shipping fever. Other conditions such as COPD (“heaves”) and rhabdomyolysis may be exacerbated by transport (dehydration of the airways, elevated head position, poor air quality) and hot or hot and humid conditions. Dehydration has also been identified as an important effect of transport, even in experienced travellers. We recommend a veterinary examination at least 4 and preferably 8 weeks in advance of long distance transport. Any proposed changes in diet should be introduced well in advance of travel (at least 4 weeks). Transport frequently induces hind-gut disturbance due to stress and dehydration. Both water content and hind gut fill may be reduced. This may be made worse by an abrupt change in fibre source. If possible, try to avoid an abrupt change in fibre source by feeding preserved forage (which can be imported into the USA; e.g. Horsehage) or by importing hay to be fed at the destination. Hard feed can usually be exported to the destination in advance, obtained locally at the destination or even taken along with the horses. If feed is being shipped in advance of the horses, the precise arrangements for transport and storage on arrival should be carefully investigated to prevent spoiling.

Training horses to drink water with electrolytes added will assist rehydration during and following transport and exercise and reduce the risk of development of serious dehydration. Sudden addition of large volumes of electrolytes to drinking water, even if masked by glucose or flavouring, is usually poorly accepted. Gradual introduction of small volumes of electrolytes over a period of time often achieves a higher degree of acceptability. As maintenance of a normal or increased water intake is important in ensuring recovery from transport and acclimatisation, addition of flavouring prior to transport or the use of water filters may be beneficial. Apple juice seems to be accepted by the majority of horses.

An accurate pre and post-transport weight is extremely useful and can be used to judge the need for active rehydration (iv or nasogastric fluids) on arrival and for monitoring recovery in bodyweight. Horses used to transport and transported in ideal conditions (cool conditions, plenty of space, good driver, well designed truck, etc) can still lose around 1-2 kg per hour. 2-4 lb per hour). This may not be an issue for a six hour trip but if the horse then has to stand in a hangar waiting to be loaded onto a plane for a 10 hour flight, this will compound the total fluid loss. For journeys of over 6-8 hours to reach an airport prior to a flight of the same duration, it would be advisable to arrive at least 24 hours in advance of the flight in order to allow the horses to rest and rehydrate prior to the flight. Weight losses during flying are very similar to those encountered during road transport.

A relatively low aircraft hold temperature of around 16°C (61°F) will help to minimise fluid loss. Horses should be travelled on clean, dust free bedding if possible (paper, cardboard, good quality wood-shavings). Addition of compounds containing zeolites (e.g. Stable Boy™) to neutralise ammonia from urine will reduce irritation to the respiratory tract. To maintain the air quality as high as possible, horses should be fed soaked hay or haylage. To minimise losses of fluid and gut fill, horses should be given small hard feeds frequently and have water provided constantly in buckets hung in front of stalls. For horses known to be poor travellers or prone to shipping fever, in addition to the above precautions, the following may be considered: pre-transport (1-2 h) administration of 10-15 litres (2.5-4 US gallons) of isotonic fluid by nasogastric tube; probiotics; prophylactic antibiotics; provision of a wider than normal pallet (air stall). In addition, for horses with known respiratory disease, encouraging the horse to bring its head down low by offering carrots or apples by hand may assist clearance of mucus from the airways.

A routine physical examination should be conducted on arrival (temperature, pulse, respiration, gut sounds, etc). In addition, the horse should be weighed as soon as possible to estimate weight loss following transport. Horses losing more than 4% bodyweight may benefit from immediate

administration of 10-15 litres (2.5-4 US gallons) of isotonic fluid by nasogastric route. Horses losing in excess of 6% bodyweight may benefit from immediate administration of intravenous fluids. It may take a horse 5-7 days to recover to its pre-transport bodyweight. Horses should be weighed each morning at the same time and in relation to feeding to monitor recovery in bodyweight accurately.

It is sometimes assumed that the least experienced “travellers” are the ones to worry about, especially in advance of a long period of international transport. However, it is not uncommon for the “old-hands” to show a marked adverse response to transport. On a three-day road journey to Italy with one of the British three-day event teams, it was several of the older and more experienced horses that need en-route rehydration, with some of the newer team members taking things in their stride.

### **Training, Fitness and Ability**

Field or treadmill based tests carried out on horses competing in international teams have demonstrated a tremendous range in fitness and athletic ability. This has been particularly marked in the three-day event and endurance teams. Many factors may be important in determining fitness and athletic ability at a given point in time when an exercise test is carried out, including age, breed, training programme, concurrent problems that may affect training (e.g. chronic low-grade lameness, sub-clinical respiratory disease, etc) and the skill of the rider.

A verbal discussion or questionnaire may help to clarify the type of training programme that a rider is carrying out. Given that the most frequent reason for horses being unable to train or compete is lameness, the training programme should provide quality cardiovascular and musculo-skeletal stimulation in order to illicit a suitable training response. Having a rider detail their training programme, especially if accompanied by information obtained on workload with a heart rate monitor, can be especially informative. With endurance and three-day event horses, a common problem is that after the initial period of training in the early season, there is a continued high component of high volume, low-intensity work (essentially trotting). This has almost negligible influence on cardiovascular and muscular training and will undoubtedly be associated with an increased risk of orthopaedic conditions. Quality cardiovascular and muscular training is associated with work producing heart rates in the range 170-200 bpm. In the same way that training at low heart rates is of limited value, excessive numbers of exercise bouts at maximum heart are of little benefit for primarily aerobic type exercise. We have seen a number of cases where individual international standard horses perform well in the dressage and showjumping phases of three-day events but consistently fail to make the time in cross-country and that this is associated with a below average level of fitness based on a field exercise test.

### **Acclimatisation**

Horses will cope much better with hot or hot and humid conditions after 10-14 days daily exercise in such conditions. Initially horses should be worked for periods of up to 1 hour in the cooler early morning, gradually increasing the amount of work and starting the work later in the morning to expose the horses to more thermally stressful conditions. Horses may appear tired and depressed in the first 2-4 days of acclimatisation training, but should begin to show improvements by 5-6 days. Horses not showing improvement by 7-9 days may be having difficulty in acclimatising. This seems to affect only a small percentage of horses. Acclimatisation will not compensate fully for effects of heat or heat and humidity, but should increase exercise tolerance and reduce the risk of heat related disorders. Bodyweight, water intake and TPR should be monitored daily during acclimatisation. A small gradual decrease in bodyweight is not unusual due to increased energy expenditure to control body temperature. Many of the problems related to the speed and endurance phase of the three-day event competition at the 1992 Barcelona Olympic Games may have been compounded by the fact that many horses were not acclimatised. At the time of these Games the perceived wisdom was to

exercise in the cooler parts of the day and avoid exposure to the heat, despite the fact that the competition would be run over the hottest part of the day. It is essential that horses are allowed sufficient time to recover from transport before the initiation of acclimatisation. For flights of greater than eight hours and where a number of time zones have been crossed, a period of 5-7 days should be allowed before attempting acclimatisation.

### **Health Status**

The most common finding in performance horses in the UK, that according to their riders are healthy and performing well, has been the presence of sub-clinical airway inflammation. This has been true for Three-day event, Dressage, Showjumping and Endurance teams. On two occasions prior to major world championships, we have found teams in which all animals had airway inflammation of a degree which required medical treatment. Other unexpected findings have included very high CK and AST activities and a grade 4 heart murmur.

### **Competitions**

In the past 30 or so years with the increasing interest in equine exercise physiology, a great deal has been learned about the response of horses in competition.. This is especially true for the sport of three-day eventing where the stimulus was related to the problems of hot or hot and humid climates, such as the Olympic Games in Barcelona in 1992, the World Equestrian Games in the Hague in 1994 and the Olympic Games in Atlanta in 1996. Eventing originally evolved as a sport for the Spring and Autumn. However, the international nature of sport now means that such events can be held all over the world and at times of the year that are perhaps more attractive for spectators than competitors and their horses.

At the 1992 Atlanta Olympic Games, the thermal stress as determined by the Wet Bulb Globe Temperature (WBGT) Index averaged 27.7 (shade temperature 29°C [84°F], relative humidity 46%). The average rectal temperature at the end of the cross-country (for horses that completed) was 41.5°C (106.7°F). However, many horses had rectal temperatures in excess of 42°C (107.6°F). As the thermometers being used in Barcelona would only register up to 42°C, the average rectal temperature is probably an underestimate. From our experience, horses cope well with rectal temperatures up to 40-41°C (104-105.8°F), provided that they do not remain at this temperature for more than a short time. Rectal temperatures in excess of 42°C (107.6°C) should be a cause for concern and may be associated with an increased risk of heat stroke. At the 1994 World Equestrian Games in The Hague, the conditions were even more thermally stressful with an average WBGT index of 28.6 (shade temperature 32.2°C [90°F], relative humidity 38%). However, despite loose sandy soil on the roads and tracks phases, which increased workload and therefore increased body temperature and fluid losses, the average end of cross country rectal temperature was only 41.3°C (106.3°F). The main change from Barcelona two years previously was the use of large volumes of water for cooling in the 10 minute box.

Based on the experiences in Barcelona and The Hague, the field trial in Georgia in 1994 and the findings from the international research programme, the 1995 Atlanta Cup (the pre-Olympic trial of the venue and organisation), was modified to try and allow for the hot and humid Georgia summer climate. The main changes in relation to the standard format of the speed and endurance phase were an early morning start, finishing by late morning, a 10 minute mandatory halt for cooling after the steeplechase, a reduced distance of the second roads and tracks and an extended 10 min box. These modifications were highly successful and formed the basis for the competition structure at the Olympic competition the following year. In Atlanta the WBGT index reached 30.1, yet despite this, the average rectal temperature for horses finishing the cross-country was only 40.4°C (104.7°F).

Over the 10 years pre-ceding the Atlanta Olympics, the average percentage of horses finishing the four star level Burghley and Badminton three-day events in ideal climatic conditions, was 60%. In

Atlanta in 1996, 57% of horses starting finished the team competition, whilst in the individual competition the figure was slightly lower at 53%. Injuries to horses following the cross-country were minor and there were no cases of heat exhaustion/heat stroke, anhidrosis or tying-up. The main factors contributing to the success of the Atlanta Olympic Games three-day event speed and endurance test was the early starting time, the introduction of a cooling stop after the steeplechase, an extended 10 min box and probably above all, the global use of aggressive cooling with cold water.

### **Summary**

The international level competition horse is often pre-disposed to sub-clinical problems. The demands of training, travel, acclimatisation, stress, changes in diet, etc, can all take their toll. Attention to detail and good planning can maximise the chance of a horse being able to perform at its potential. Whilst most international standard riders will have a good regimen, there is nearly always room for some improvement.