

## Heat Stress and the Endurance Horse: Electrolytes are not the only answer!

Gayle Ecker, Equine Exercise Physiology  
[caspian\\_uvh@hotmail.com](mailto:caspian_uvh@hotmail.com)

These suggestions are a combination of the results of my research (along with Mike Lindinger) as well as the result of many discussions with riders, veterinarians and pit crew people.

The recent thread on heat stress in endurance horses generated a great deal of very good discussion about optimal management of the endurance horse. Concerns have been raised about the number of horses at the PAC that needed treatment.

Electrolyte supplementation, while a VERY important part of the equation, does NOT address the heat build up that occurs with exercise. The major route of heat dissipation is through the evaporation of sweat. Note that we said the evaporation of sweat. Sweat that runs off the horse or sits on the skin without drying quickly will not contribute greatly to the heat dissipation. A high humidity level will compromise the evaporation of sweat, even if the weather is cooler. During our research, we have documented significant losses of water and electrolytes even in cool weather because the humidity level is high. The horse still generates large amounts of heat, but dissipation is compromised due to the high humidity. Water and electrolyte losses can be high with high humidity even if the temperature is around 21 d C or 72 d F.

We are fighting physics. The horse does not have as much surface area to dissipate the heat as does the human. Nor can we force the horse to drink as much as it needs to replace the water losses. Of all the horses we have included in our research studies, NONE had enough water to replace the losses. Most never came more than 1/2 to 2/3 of the water loss. While this may not have put the horse in a position where vet treatment was necessary, these losses were certainly at a level where circulation and cell function would be affected. This would definitely impact continued performance. For the horse that is working within its capacity, this may not have a noticeable effect, but the horse that is being pushed a little harder may have greater problems with the added stress.

Currently, with our performance profiling, we are starting to see horses that are receiving enough electrolytes to replace the sweat losses, but they are still in a water deficit situation. The reduced total body water compromises blood circulation as blood volume is made up of predominantly water. The reduced blood volume means that less blood is available to get to all parts of the body, therefore, skin blood may be reduced, which means that heat dissipation is compromised. Blood flow to the muscle may be reduced, meaning less energy is taken to the muscles (and the muscles begin to rely more on the local muscle stores) and the efficiency of removal of heat and other metabolic wastes from the muscle can be compromised, leaving heat in the muscle. Blood flow may also be reduced to the gastrointestinal tract, which means that the absorption of water and electrolytes and energy will be slower, thus prolonging the time for replacement of the deficits, and predisposing the horse to colic-related problems.

Conditioning and heat acclimation are two other very important components of a horse's ability to compete in the heat. A well-conditioned horse will be able to withstand exercise in the heat better than an unconditioned horse. However, this does NOT mean the horse can handle exercising in heat and humidity at the same level.

The performance level will drop. For example, the horse may only be able to exercise at that speed for half the time when high heat and humidity are present. Acclimating the horse to exercising in the heat and humidity will gain back some of that time, but never all of it. The horse must slow down if it continues to exercise.

During many conversations with riders, people often comment that because it is not hot, they are not concerned about a hot horse. However, rides with some of the most problems are not the hot ones, but rather the high humidity ones. The temperature does not have to be high. Some of the rides have had temps of only 70 d F or about 20 d C, but with humidity of 80-90%. This impairs evaporation of sweat, and it is the evaporation of sweat that takes the heat away. If the sweat does not evaporate (ie., leaving dry hair below) then the sweat is contributing little to heat loss.

Well conditioned, motivated horses do not always show the signs of heat stress/dehydration/electrolyte depletion until they have rested a bit and the "adrenalin rush" has calmed. Then the problems start to show the clinical signs. Also, the longer the blood flow has been reduced to an area, the greater the chance of developing problems.

We have some wonderful, knowledgeable and caring veterinarians in this sport. However, they have only a few tools to use to when checking over a horse and only a few minutes for each horse to gain a "picture". It cannot and does not tell the whole story. If the vets were able to pull blood and take weights on these horses as they come in to vet checks and perhaps before they went out again, then they would have more information and perhaps fewer horses would have to be treated at rides. Given the cost of doing on-site analysis, this is likely not feasible without financial assistance. It may be possible at the international rides, but certainly not for the smaller rides.

So, as riders, we all must learn about our horses and pay attention to the signs (working very hard to avoid D.I.M.R!). Dr. Mike Lindinger and myself have been doing research on endurance horses for many years and (unfortunately) have collected a great deal of data on horses that do not complete the ride. In many, many cases, the rider has made comments like, "Well, he wasn't as eager as usual, but I was in a hurry at the vet check and I didn't pay much attention." It is difficult when the clock is ticking and there is so much to think about and get done. It may be hard to pick up on the more subtle signs the horse gives us unless we pay close attention. We cannot depend solely on the vets to pick up on these signs and must be more attentive to our mounts.

The CRI is one of the tools that is useful for the vets to use. The usefulness of the CRI is that it is a sensitive, though not specific, indicator of stress in the horse. And there are horses that seem to give us little or no outward sign. There may be changes in the blood work, but outwardly, the horse shows few signs of an impending problem.

A delay in seeking treatment for a horse in distress will very likely result in a condition that is much worse. It is quite remarkable how fast a horse will turn around with prompt and effective treatment to replace the water, electrolytes, and energy deficits. The longer an animal (or human) is in a deficit situation or the longer the heat stress/exhaustion persists, the greater the chance of serious health problems developing. Often, horses and human marathon runners are never able to achieve previous levels of performance after suffering from heat stress/exhaustion/stroke. Although clinically, there does not appear to be something physically wrong, it seems the chemical pathways and/or the body's thermostat never fully recover. Prompt effective treatment is preferred for the safety and long-term performance of the horse. Many ride vets prefer to begin treatment promptly to prevent the problems from becoming more serious. This may be one reason why we see more horses treated at rides. Replacing the water, electrolytes, and energy quickly and effectively, through oral or I.V. administration can make a big difference to the health of the horse and head off more serious problems. This shows a high level of concern and professionalism on the part of the vets. But, this should also be a lesson for the riders who may have pushed their horse too fast for the conditions and the fitness/ability of the horse.

When cooling, there are some effective methods that can be used to help cool the horse quickly. Before getting to those, however, keep in mind that these horses run hot between vet checks. The longer the temperature stays elevated (or the higher it goes between stops) the greater the potential for the heat stress/heat exhaustion/heat stroke scenario to develop. If we cannot help to dissipate the heat faster between vet checks, then the horse must go slower to reduce the heat build up. Use any opportunity you can to help cool your horse between vet checks.

Concentrate on their necks, chests, shoulders, legs (inside and out) with REPEATED applications of water. Continue applying repeated layers of water until the water coming off is not heating up. Keep the horse moving to help dissipate the heat through airflow and keep good blood circulation to and from the muscle. Although there has always been a fear about using cold/ice water on the large muscles of the horse, the Atlanta Olympic research has shown this does NOT cause a problem with eventing horses. Although the avenue of ice water should be considered for a seriously overheated horse, it is usually not necessary for adequately managed endurance horses, if the repeated applications of water are used. Do not place towels over the neck and head as they act as insulation. Do not merely throw water on the horse, as this is ineffective. The water must have time to cover the skin to pick up the heat, and then be removed. Loosen the girth as soon as you can as a tight girth restricts blood flow to part of the skin. Free up as much of the surface area as you can to let air circulate. Consider clipping the hair along the neck, chest and upper legs. This is necessary if the horse has started to develop a winter coat, as the hair traps the sweat underneath the hair, and acts as insulation.

If your horse is not eating and drinking well, slow down and take more time at the vet check area. The horse needs time to cool down, restore blood flow to the gut, and relax before the gut can start to work more efficiently to absorb water, electrolytes and energy. The longer holds allow the horse time to replace the sweat losses and regain energy. For many horses, this strategy (taking time in the beginning of the ride to let the horse eat and drink) pays off later. The horse gets stronger as the day goes on and finishes well. Horses that have higher body mass losses early in the ride will finish with a slower ride speed if that deficit is not effectively replaced and the water and electrolyte balance restored. When administering electrolytes, think about giving electrolytes for the next hour of sweat losses, not to catch up on what was lost on the last loop. Trying to "catch up" while still exercising is very difficult to do as the gut is not functioning at optimal levels and needs more time. Get creative to get as much water into the horse as you can by adding it to grain rations, soaking the hay, soaking beet pulp, etc. More horses are "under-watered" than "over-electrolyted" (but that's another complete thesis!).

It is also worthwhile to stop and check your own hydration. A sweat loss resulting in as little as 3% of body mass can result in cognitive impairment, i.e., if you are given a simple mathematics test following a dehydration of about 3%, you do not score as high as you would when fully hydrated. Therefore, it is possible, that due to the dehydration-induced cognitive impairment, riders may in fact miss the signs the horse gives us. Fluid losses in riders may be 1-2 L/h, depending on conditions. We take a great interest in the color of the horse's urine (the darker yellow means more dehydration). It may be advisable for the rider to show the same concern towards him or herself!

Courtesy of [www.Endurance.Net](http://www.Endurance.Net)