Choosing the right electrolyte

by Susan Garlinghouse, DVM

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In the ongoing debates about the use, frequency and advisability of electrolytes for the working endurance horse, the oft-asked question is, "What brand of electrolytes is the best?" This begets the real question of, "What's the real difference between Brand A and Brand B (versus plain table salt)"?

Let's start with a brief review of what electrolytes are in the first place, and what goes into a formulation appropriate for endurance horses both at home and during competition.

Electrolytes are molecules that, when dissolved in water, break down into component ions (for purposes of this article, primarily sodium, chloride, potassium, calcium and magnesium) that carry a small negative or positive electrical charge. The charge enables them to conduct electricity throughout the body, carrying signals to target cells and organs. Virtually every cellular function in the body depends on these electrical signals, and critical depletion or imbalances can cause physiologic systems to slow or shut down entirely.

When faced with an endurance horse in metabolic trouble, aggressive intravenous fluids are always the primary treatment utilized to correct the problems. Aside from just water to correct dehydration, IV fluids also provide balanced electrolytes to replenish those lost during exercise through sweating, thus restoring normal physiologic function.

At home while being fed a forage-based ration, little supplementation of specific electrolytes other than salt are needed. Quality hay or pasture provides more than sufficient potassium, magnesium and usually calcium. Sodium can be variable, but generally is insufficient to provide for prolonged exercise typical when conditioning. To prevent deficiency, free choice salt (loose, non 'trace mineral' is preferred) should always be available at all times.

While salt can be added as a top dressing to feed, salt is the only mineral which horses develop a specific appetite for in times of depletion, and will seek out voluntarily to correct that deficiency at the appropriate level. This is NOT true of other minerals or nutrients, and marketing claims of feeding systems allowing animals to 'balance' their own rations have no basis in scientific data. Unless habituated to high salt in the feed over time, most animals will reject feed higher than 1% sodium (that would be equivalent to about one ounce of table salt in six pounds of mash).

Likewise, salt at home does not need to be anything other than some variation on just plain table salt. While the flavor and texture may vary slightly depending on the source, there is no nutritional advantage to salt that has been derived from seawater, mined from primordial sources or dried/not dried in high temperature kilns. Both sodium and chloride (as well as potassium, magnesium and calcium) are elements, and their basic structure and chemical properties cannot be changed to the slightest extent outside of a supernova or nuclear reaction. They can be bonded and re-arranged with other elements to form different molecules, but how those basic elements were initially obtained is completely irrelevant. Nutritionally, the fifty pound sack of table salt from the warehouse store is exactly the same as the salt dug out by hand and reverently sold by the teaspoon from secret mines in the Andes.

This being the case, other than introducing the horse to new flavors, there is no particular advantage to providing a specific electrolyte formulation to horses at home, except perhaps during prolonged conditioning rides. A quality ration alone, with some free-choice salt, is more than sufficient, as well as much more economical.

So why the attention to electrolyte products formulated specifically for the endurance horse? The key difference between at-home availability of electrolytes versus at endurance rides is the ongoing demand in the face of fluid loss, and the time available to the horse to eat and replace those minerals throughout the day at rides. At home mostly at rest, electrolyte loss is minimal and the horse has plenty of time to eat hay and pasture, allowing sufficient opportunity to replenish electrolytes.

At endurance rides, time to eat is limited to a few mouthfuls here and there along the trail, and limited amounts of time in vet checks. In addition, electrolyte loss through sweat can be considerable—on average, one ounce per hour of exercise, with up to four ounces per hour under extreme conditions.

Although sweat loss can vary widely depending on heat, humidity, intensity of exercise and fitness of the horse, a good approximation is provided by work published by Hal Schott, DVM, PhD, DACVIM of Michigan

State University. Under ambient conditions, at an average walk, trot and canter to simulate ride conditions, horses can be estimated to sweat approximately 5 liters (1.34 gallons) every ten miles. Over a fifty mile course, that extrapolates to approximately 7 gallons of sweat—which in turn, also means a loss of 7 ounces of electrolytes, primarily as sodium, chloride and potassium, with smaller amounts of calcium and magnesium. Again, bear in mind that conditions can vary widely, and hot, humid weather or challenging terrain also means considerably higher fluid and electrolyte losses (up to 4 gallons of sweat and four ounces of electrolytes per hour).

At the same time as these ongoing losses, sufficient time to eat enough hay (normally, the primary source of potassium, calcium and magnesium) is limited, even with efforts to graze along the trail and hand out baggies of mash now and then.

Does this mean that efforts should be made to replace all of that electrolyte loss during the ride? Absolutely not—-although minimizing electrolyte depletion is a desirable goal, electrolyte supplementation can be a double-edged sword in many ways (but is outside the scope of this particular article). Even aggressive electrolyting protocols will, at best, replace only about 50% of ongoing losses. More conservative, and less risky strategies, aim to replace about 33% of ongoing losses. The hind gut itself acts as an intestinal reservoir, potentially providing several gallons of water and electrolytes.

For horses that are ridden well within their athletic capability, in ambient conditions, no additional or minimal supplementation may be needed. Certainly many superb equine athletes have been managed at even the highest levels without aggressive supplementation, simply through good conditioning and careful cooling strategies during the ride. Erring on the side of caution is especially warranted in individual horses with a suspected or proven history of gastric ulcers, or for those who stop eating for a significant amount of time after electrolyte administration. In those cases, less is more in encouraging optimal forage intake instead of electrolyte replacement.

For most horses, a reasonable electrolyting protocol, with the aim of replacing 30-40% of losses, is providing the equivalent of two ounces of salt prior to the ride, with an additional one-ounce dose at each vet check after the horse has had a good drink. Providing an additional small pan of loose salt mixed with a high value feed at checks may also be an option for some horses. Offering an additional bucket of slightly salty water (about one ounce of table salt added to a gallon of water) as the initial source of water coming into a vet check has also proven to be a valuable strategy to replenish electrolytes and encourage subsequent drinking.

Interestingly, some horses that have learned that one of their buckets is likely to provide a salty solution will specifically seek out that bucket first, an excellent habit to encourage. For many of these salt-hungry horses, a concentrated salt solution of a cup of salt dissolved in a gallon or two of water will be readily consumed.

Here's where "what's the best brand of electrolyte" comes into consideration. All electrolytes are going to be comprised of primarily sodium, chloride and potassium—-some also provide a smaller amount of calcium and magnesium. Most brands on the market, certainly those designed for performance horses, have been formulated to provide electrolytes in the same ratios as those lost in sweat.

Differences between specific brands tend to have to do with the amount needed to deliver the equivalent of a one ounce dose of table salt. Fillers, including sugar, flavorings and other sweeteners provide a perception of being less harsh and more palatable, but also provide less of the actual electrolytes needed by the body. As such, considerably more product must be provided to deliver a true dose. The best-tasting product on the planet won't do the horse any measurable benefit if the 2 or 3 ounce dose is largely just molasses or sugar with a tiny smidgen of salt. Although some glucose in the small intestine is needed to help with the absorption of sodium, the exact amount required has not been quantified, and opinions (and thus formulations) vary.

Also consider price in choosing an electrolyte product. A brand that costs a dollar per (true) dose is a more economical choice than another product that costs fifty cents per dose but requires providing 3-4 doses to provide the same amount of salt.

Also consider that by choosing a more concentrated product with minimal sugar or fillers doesn't mean that you can't add your own. Options are mixing a dose of electrolytes 50-50 (or more) with molasses, corn syrup, applesauce or a buffer such as kaolin-pectin. Kaolin-pectin is available in the cattle section of most livestock supply stores and considerably more economical than buffers marketed specifically for horses but with little real difference between them. When adding other substances to the electrolytes, remember that as a now diluted product, you will either have to administer twice as much, or dose twice as often (the author personally prefers the latter approach).

A handy reference tool in comparing electrolyte products can be found here: http://www.karenchaton.

com/electrolytes/ with a comparison chart of numerous popular brands of electrolytes, both those designed specifically for endurance and performances horses, and those containing more of a generic formulation.

In reviewing, choose a supplement in which NaCl (sodium chloride) is provided in an approximately 3:1 ratio as potassium (not all of them do). If not provided, the NaCl content can be calculated by adding the sodium content together with HALF of the chloride content.

Do the math and notice how much of each product (regardless of the suggested "dose") is required to deliver the equivalent of approximately 12 grams (12,000 mgs) of NaCl and 4000 mgs of potassium.

As an example, EnduraMax provides 6000 mgs of sodium and 12,500 mg of chloride per dose. 12,500 divided by 2 is 6250, so a one ounce dose provides a total of 12,250 mgs, or 12.25 grams of NaCl per one ounce dose, in addition to 3900 mgs (3.9 grams) of potassium—-a good target dose for working endurance horses. Sugar content is less than 15%, but the powder can be mixed with buffers and sweeteners as above, if desired.

By comparison, consider Stress-Dex, a more generic electrolyte product not specifically formulated for endurance horses, with a sodium content of 1704 mgs per ounce (and approximately 3400 mgs of NaCl per ounce, or 3.4 grams). To deliver a target dose of 12 grams of NaCl, a rider would need to administer over 3.5 ounces of product, even before mixing with other buffers or sweeteners. If mixed 50-50 with a buffer, that's a whopping 7 ounces, or three and a half 60 ml dosing syringes, that would have to be administered for each dose—-a good trick in excited horses during a ride! Also note that added sugars can represent up to 73% of the total product, which carries the potential to affect glucose and insulin responses, depending on when the dose is administered.

Finally, in evaluating ingredients, stay away from products that include sodium bicarbonate in the formulation. Horses competing in sprint type competitions may develop more acidic blood pH that might benefit from such ingredients. Endurance horses are at the opposite end of the spectrum in developing a higher, more alkalotic blood pH, and such ingredients are generally considered inadvisable, as they carry the potential to decrease availability of calcium ions during exercise, increasing the risk of developing muscle cramps or thumps.