Most horse riders know that a sweating horse will need electrolyte support. So how is it best to support your horse with the electrolyte minerals it needs, what are electrolyte minerals and why pay attention to the amounts in your forage?

The major electrolyte minerals are sodium, followed by chloride and in smaller amounts potassium. Very small amounts of calcium and magnesium are also needed.

Sodium is vital for many cellular processes including muscle contraction. This mineral is involved in movement of glucose into cells. Glucose is then metabolised in the mitochondria, which is the powerhouse of the cell, to produce energy. When your horse is low in sodium, this mineral is drawn into the bloodstream to maintain concentration and balance, this means that less glucose can be transported into the cell and this is when you might see lethargy and tiredness in your horse. As sodium commonly shows up as being low in UK forage then this electrolyte can have a high impact on the performance of a horse in even light work, so electrolyte support with sodium is crucial.

Sodium and dehydration of horses

Where a shortfall of sodium occurs at low levels of work or even at maintenance then the body will always be playing catch up. As sodium is the major controller of water balance in tissues, low levels in the horse's diet are likely to lead to the horse drinking less water

and becoming dehydrated. Some horses can effectively be dehydrated for years due to low levels of sodium in the main forage portion of their diet. You may see this as wrinkling of the skin especially over the hind quarter area as they walk. A pinch test can also be used in the neck area to check the elasticity of the skin, and see how quickly it rebounds after it is pinched. As sodium is what the brain 'reads' in determining when to trigger thirst and when to regulate the amount of sodium and water the body excretes in the urine, this is why a shortage of sodium is likely to lead to less drinking of water as the body tries to balance the amount of sodium needed to maintain homeostasis in the blood. The pinch test seen used in endurance competitions is where the vets are essentially looking for a sodium deficiency. Dr Eleanor Kellon VMD, a leader in equine nutrition reports that as little as 2 to 3% dehydration can lead to a 10% drop in performance.

Electrolyte Support for Endurance Horses

The interesting thing is to ponder how many endurance competitors have analysed their

forage to see what levels of sodium are contained in that which is the greatest portion of their horse's diet. Most competitors leave this vital part of the performance jigsaw to chance, guessing on the amounts of sodium and other electrolytes their horse will need to maintain levels during periods of extreme performance. Where sodium levels are adequate then guessing the amount may well avoid the dreaded drip at the end of the race but for the horses which run low on sodium we suggest that low levels in forage are the culprit and that simple analysis of that forage could support and maintain healthy electrolyte levels by leaving nothing to chance or guess work.

Chloride is involved in a host of reactions that include maintaining normal pH, fluid volume and electrical conductivity of cells. Forage seems either to be very well supplied with chloride or very poorly supplied. Where your horses's forage is in the poorly supplied category, guessing how much your horse needs may well lead to reduction in performance when your horse starts to sweat due to heavy work.

Potassium is the major electrolyte inside a cell but is very well supplied in grass, hay and haylage. Normally it is so well supplied that unless your horse is competing in lengthy endurance rides extra supplementation is not required. The forage our own horses eat for example, supplies enough potassium for 5 hours of constant heavy sweating so we have never had to supplement extra as we have never exceeded this 5 hour point. However it is always wise, if you are demanding high levels of continued exertion from your horse, to analyse the forage eaten so you take the guess work out of supplementation. The difference in sodium and potassium concentrations outside and inside cells is responsible for excitability of muscle and nerve tissue so getting the ratio between these two minerals correct by feeding adequate sodium is important. If potassium is deficient (which is very rare in a horse on a forage based diet) symptoms can include fatigue, heart rhythm irregularities, muscle weakness or tying up (Rhabdomyolysis) and nerve irritability, also known as 'Thumps'.

So how do you know what electrolyte support your horse needs?

The National Research Council (NRC), in the current 6th revised edition of *Nutrient Requirements of Horses (2007)* gives the following calculations to determine *maintenance* requirements based on body weight (BW). For sodium it is 0.02 x

BW and chloride, 0.08 x BW. A 450 kg horse requires 9 grams of sodium and 36 grams chloride per day. Note that these are *minimum levels* and do not take into account sweat losses on a hot day or through exercise. Our statistical analysis of forage has shown that on average horses often obtain far less than 9 grams of sodium per day through the forage they eat.

Dry Matter			Analysis	Very Low	Low	Mean	High	Very High
Dry Matter		(g/kg)	891					
Macro Minerals			**Analysis**	**Very Low**	**Low**	**Mean**	**High**	**Very High**
Phosphorus	P	%	0.18					
Magnesium	Mg	%	0.16					
Calcium	Ca	%	0.73					
Sodium	Na	%	0.13					
Potassium	K	%	2.07					
Chloride	Cl	%	0.83					

A forage analysis like the one above will allow you to balance your horse's diet to the common mineral deficiencies found in the forage eaten, covering all minerals and of course the electrolytes. The analysis shows good levels of potassium and chloride in the forage. Levels of sodium however are low and although they will cover a 450 kg horse's maintenance needs at 10.4 grams of sodium per day, once this horse begins to sweat then a shortfall will occur which needs to be supplemented to maintain optimum health and performance. To cover sweat losses feeding 30-50 grams of salt per whole hour of heavy sweating after exercise to replace electrolyte losses after work is very wise. You can do this easily in a small amount of feed *after the horse has drunk.* Adding a small amount of oil or a high oil feed such as micronised linseed or copra will help to protect the stomach if a high level of salt is needed. A level 25 ml scoop of salt contains approximately 9 grams of sodium and 14 grams of chloride.

If you cannot carry out a forage analysis then feeding a 'forage focussed' balancer is wise. The balancer should target only those minerals which are commonly deficient as matched to ratios. This means that your horse will have access to the right amounts of minerals to maintain health without excess minerals acting to block uptake. Potassium is usually supplied in UK forage at more than adequate levels for at least four

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hours of heavy sweating. Sodium and chloride should be supplemented in the form of plain salt which can be purchased very cheaply from a supermarket. Some people might prefer to feed rock or sea salt in order to avoid the flow enhancers added to table salt. In the UK 5 grams of salt is a low statistical average (taken from our many hundreds of forage analysis) to add to horses' feed to cover maintenance electrolyte requirements . This is the amount in 100 grams of our balancers, we double this amount to 10 grams in the Performance Balancer. Any excess of sodium and chloride, if your forage is well supplemented with sodium (uncommon) or chloride (more common), is easily and efficiently excreted from the kidneys. Of course, ample drinking water should always be provided at all times so that horse can hydrate themselves sufficiently.

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Is a salt lick enough for electrolyte support?

You should provide a salt lick too in addition to supplementation of salt each day but don't

rely on this to provide your horse with the electrolytes it needs either for maintenance or replenishment of those lost through sweating. There are two good reasons for this. One, it is guess work as to how much a horse can actually lick from a salt lick and two, some horses won't touch salt licks even though they may be short in electrolytes. Adding salt to a feed will ensure you know your horse has sodium and chloride needs covered. Use forage and mineral balancing to check potassium, calcium and magnesium levels or feed a forage focused balancer.

Pay close attention to salt levels to get the best equine performance.

A couple of years ago we had an interesting experience on the importance of getting electrolyte balance right, as matched to the forage eaten, with our Arab, CSA Mahrice (Moo), who was competing in his first year of endurance with EGB. We were feeding minerals balanced to our forage and had calculated electrolyte losses as matched to the sweat losses for moderate work. As the season progressed Moo gained grade one after grade one. However at one ride he gained a grade 2 and took half an hour to start drinking after the race, he also got a dehydration score of 1. Fairly normal you might think if you are an endurance rider but we weren't happy as something was wrong if he wasn't drinking. On going back to our calculations and checking them, it was apparent that we had not been accurate enough and that the replacement of sodium in particular had been too low. Dr. Kellon advised us to load with sodium for two weeks at 100 grams of salt per day in order to replenish the low levels which had occurred due to insufficient replenishment after sweating. The next ride we competed in was two weeks later and he not only passed urine 2 times during the 42 km ride (an indication of good hydration and something he hadn't done before) but he also drank during the ride from streams and troughs and immediately on finishing the race. He got a grade 1 again and no dehydration score.

For the rest of season we paid close attention to mineral and electrolyte levels at the correct work level of heavy and had no further dehydration scores and grade 1 levels. We didn't use anything fancy as an electrolyte supplement, just plain old table salt you can buy from the supermarket fed at levels matched to minerals in our forage and to heavy sweat losses.

Our top tip is to know, not guess what electrolytes your horse needs and supplement the appropriate level of salt to maintain health and high performance no matter what your horses' discipline.

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