

# DEHYDRATION, REHYDRATION AND ELECTROLYTES

By Dr. J H Stewart

**W**ith summer upon us it's time for a refresher on the impact of hot weather on horses and their need for salt. Horses sweat to control their body temperature. As the weather warms air temperature increases - meaning there is less difference between the air temperature and body temperature. This makes it harder for horses to cool themselves - and if the weather is humid as well the ability to cool via sweating is also reduced. Even if the horse increases sweat production, less evaporation occurs when the air is warm and humid. A major consequence of sweating is the loss of large quantities of water and electrolytes - and dehydration.

Dehydration in the horse of just 2-3% can cause a 10% reduction in exercise capacity and performance. Administration of the correct combination of electrolytes (= salt i.e., sodium, chloride and potassium) before and during moderate to intense work can increase the time it takes for a horse to fatigue by nearly 23% - which means a horse can work for 23% longer before getting tired. Our task is to ensure that the horse is provided with adequate fluid and salt.

## SIGNS OF DEHYDRATION

Mild dehydration reduces performance, severe can be life-threatening. Signs of progressing dehydration are unsteady gait, uncoordinated muscle contractions, trembling, and muscle weakness - but these are also signs of Hendra virus and bat lyssa virus. The latter are zoonotic diseases that fatal are fatal to humans and horses and for which no treatment is available. If you live in an area where these viruses are present, rapid veterinary diagnosis is essential. Horses may lose interest in drinking even when dehydrated. Water is necessary and must not be overlooked when offering salt or electrolyte supplements. Signs of electrolyte depletion include unusually nervousness, muscle tremors, stiffness and heart rate can be elevated.

Two factors that greatly increase a horse's water and salt requirements are exercise and climate. Even at rest in hot climates, sweating becomes important for regulation of body temperature, but the combination of hot weather, exercise and dehydration increases the risk of overheating and heatstroke.

Keep in mind that the cause of sweating is irrelevant (except if due to pain) and it's not just elite athletes and high-performance horses that are losing electrolytes - pleasure, trail-riding and show horses with a busy schedule are at the same risk as the horse that sweats the same amount training over an Olympic cross-country course. During exercise, when weight loss due to dehydration approaches 4%-5% (= water/sweat loss of 23-28 litres), horses are less able to lose body heat and body temperature will increase at a faster rate. For temperature regulation and correct body fluid balance, sodium intake must be correct as well as water.

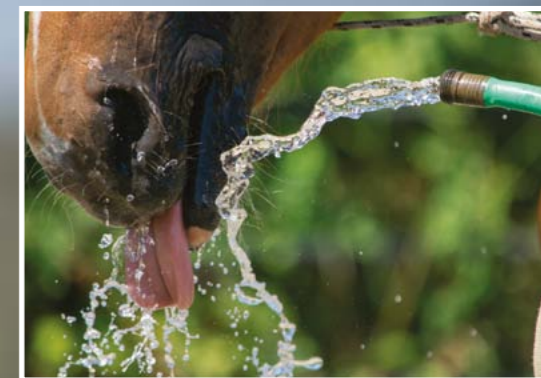
## ENDURANCE RIDING AND TRAINING

During three hours of steady trotting in 21°C and 45% humidity, a horse can lose 25kg in sweat and 250g (= 8 tablespoons) of electrolytes.

At 35°C, blood sodium levels are decreased for up to 26 hours after

exercise and even with a daily salt intake of 38g (1 heaped tablespoon), it can take several days to make up the sodium loss. However, carefully timed electrolyte and water intake can make a big difference here.

Recent studies show that administration of electrolyte pastes before and during prolonged exercise is safe and effective for minimising dehydration. For example, in one study Arabian horses were given either water or an electrolyte paste before and during 60 km exercise divided into 4 x 15km stretches. The horses were given - 90 minutes before exercise - 75g of a mix made of 50g of sodium chloride (NaCl) and 25g of potassium chloride (KCl) with free access to plain water, and 45g between the 15km legs. The horses supplemented with electrolytes and free access to water drank twice as much water and lost only 0.8% of their body weight compared to 2.8% in the unsupplemented horses.



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They also had higher blood sodium and chloride levels and recovered more quickly.

If water is freely available, you can take a few syringes of electrolytes and give them strategically during a ride.

Don't do this if water is not freely available or if your horse has stomach ulcers - on an empty stomach, electrolyte pastes and gels can irritate and also cause stomach ulcers.

## IN THE Paddock

A horse in a paddock, even in the hottest weather, probably isn't going to sweat enough to upset its electrolyte levels - with one exception: an older horse with Cushing's disease.







consume 50g a day from a salt block - you can weigh blocks regularly to determine intake. So certainly have a salt block in the stable, feed bin, yard or paddock, but monitor consumption and add extra salt to the feed if needed.

### TRAVELLING

Horses travelling in hot environmental conditions also need extra salt. Many do not drink during transit – even when water is freely available. At the end of a 600km trip, horses can be 3% dehydrated and it can take at least six hours for fluid and electrolyte balance to begin to approach normal.

### WHICH ONE, HOW MUCH AND WHEN?

**SALT** – Epsom salts, sodium chloride iodised, non-iodised, potassium chloride, Himalayan salt, electrolytes?

Cushing's can cause excessive sweating and affected horses may have a winter coat even in summer. These horses can lose significant amounts of salt. *Continued.*

A dose of electrolytes can be part of your immediate efforts to make them comfortable, along with a cooling bath. But over the long-term horses with Cushing's generally need medication and body clipping.



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Most pastures and hays are very low in sodium and salt supplements are necessary. Of prime importance is daily electrolyte supplementation. For horses on a predominantly hay or pasture diet, potassium (K) intake is usually ample. But sodium (Na) and chloride (Cl) are often marginal to frankly deficient – even in horses that are relatively inactive and not losing electrolytes in sweat. Therefore, some form of salt supplementation is a must. For non-exercised horses, voluntary intake from salt/mineral blocks is usually enough to meet Na and Cl requirements.

### IN EXERCISING HORSES

Voluntary salt intake is highly variable and in one study, the intake of four out of six horses was well below even the maintenance requirement. To replace losses from hard work, horses need to

Salt is another word for electrolytes. Sodium, potassium, chloride, calcium, and magnesium collectively are electrolytes. Epsom salts (magnesium sulphate) has no application in electrolyte replacement protocols. Sodium, chloride and potassium are the primary electrolytes and all are vital for body fluid and acid balance and for normal nerve and muscle function.

The relationship between sodium and potassium (a deficiency of which is very rare) is complex. If the body is low in sodium it will conserve sodium by reducing the amount in the urine. It does this by swapping potassium for sodium in the kidneys – saving the sodium for the body.

So, for horses with low blood potassium, the answer is often to increase salt (i.e. sodium) intake, not potassium!

Himalayan salt is chemically similar to table salt – some are OK for horses, but others not so, due to impurities, so check

the analysis. Some salt crystals from this region have an off-white to transparent colour, while impurities in some veins of salt give it a pink, reddish, or beet-red colour. According to one estimate, Himalayan salt is 98% sodium chloride, with 2% of it being minerals such as magnesium, potassium and calcium – much the same as common table salt.

Common table salt can be iodised – iodine is included at 25 to 65 micrograms per gram of salt. Horses require 3.4 – 4.5mg of iodine each day and seaweed products should not be fed with iodised salt unless the total daily intake of iodine is first calculated.

Electrolyte - a good electrolyte product should include key electrolytes lost in sweat (sodium, potassium, chloride). Equine research has established the best protocols for horse salt supplements and transferring human-medicine knowledge to the equine field has proven incompatible. Gatorade and other human sports drinks are unsuitable as electrolyte replacers because human sweat composition and requirements are different to horses!

### READ THE LABELS

The number of electrolyte supplements on the market nowadays is huge and it's important to read the product labels carefully and take note of the actual quantities of sodium, chloride and potassium in the supplement. The higher the sodium chloride content, generally the better the product. Supplements that contain a lot of sugar (> 15%) and not much else should be avoided - otherwise you will be feeding a lot of sugar and not enough electrolyte. For electrolyte syringes, a good syringe should be delivering at least 20-30g of electrolyte per dose.

### HOW MUCH SALT SHOULD BE ADDED EACH DAY?

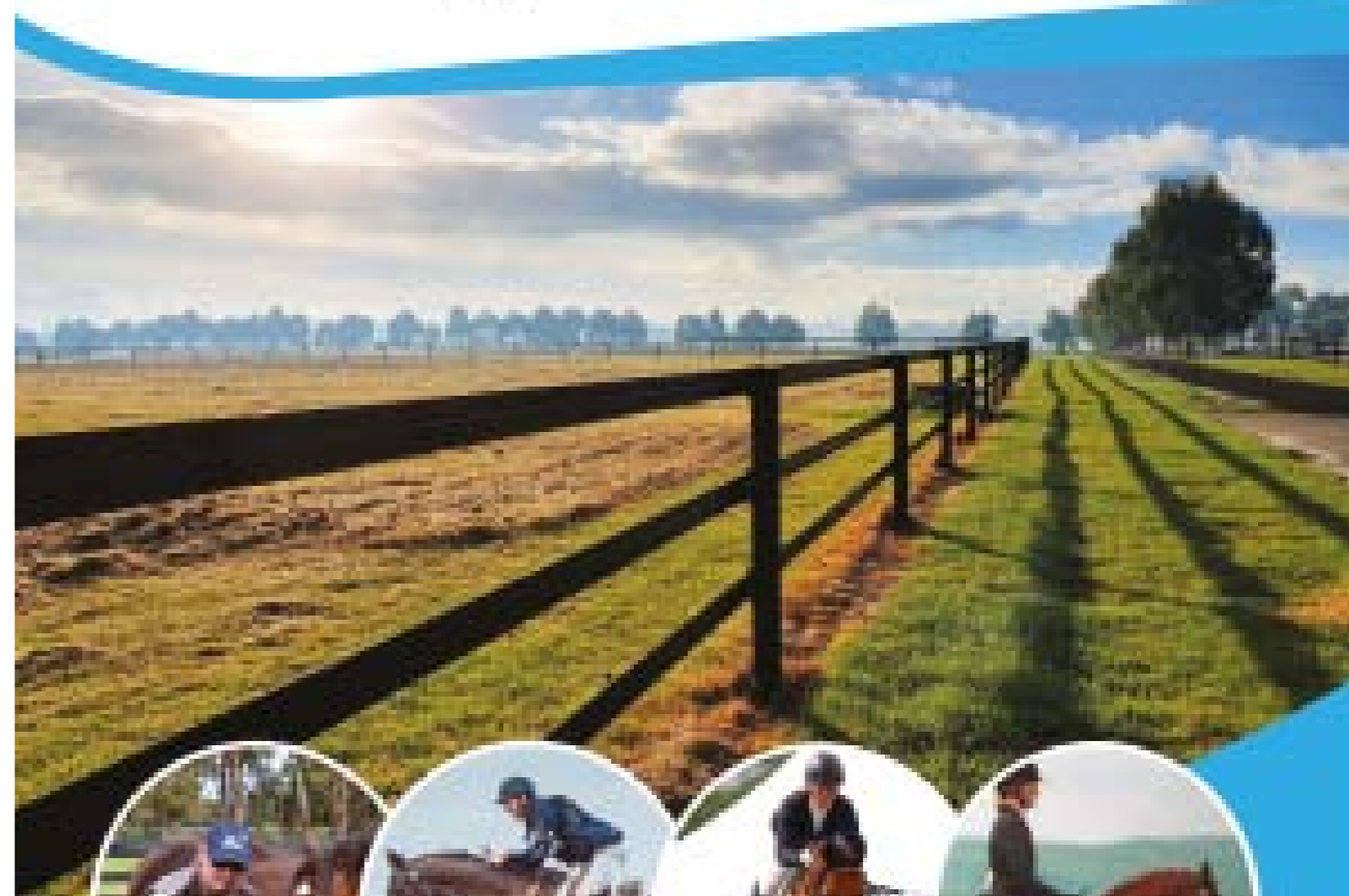
For horses doing moderate daily exercise in cool to moderate temperatures, 25g twice a day increasing to 50g twice a day in hot weather is a good rule-of-thumb. You can make this at home using straight salt (NaCl) or a 3:1 ratio of NaCl:KCl (KCl is commonly known as 'Lite' or 'Lo-salt'). In reality, horses get ample potassium (K) if they have lots of hay each day.

### WATER ONLY DOESN'T WORK

Electrolytes do not necessarily have to be replaced by oral dosing in the same amount as they are lost. But providing water alone to a horse with an electrolyte imbalance will only further dehydrate your horse – because Na is needed to move the water into the cells. Water follows salt – just watch what happens to a bowl of salt in wet or humid *Continued.*



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## ELECTROLYTE COOKIES

For the horse that is fussy about anything added to its feed, there is a cookie recipe you can try:

- 2 cups of grain,
  - 2 cups of rolled oats,
  - 600g of electrolyte mix (commercial or homemade),
  - 3 cups bran,
  - 1 to 2 cups of water,
  - 1 cup of molasses, maple syrup, or applesauce to sweeten the taste.
- Mix well and divide into 24 cookies.
- Cook at 175°C for 25 to 30 minutes. Each cookie has around 25g of electrolytes.



weather – it gets all gluggy because water is drawn to Na – this is the same process by which Na draws water into cells to restore hydration.

However, adding salt to drinking water should be done sensibly and with great care. Trials have found that horses have an abrupt 15-50% reduction in water intake the first day high sodium water was given. Feed intake dropped 25% in some horses and they lost weight for three weeks. Water intake, appetite and weight gain returned to normal when the affected horses' water supply was reverted to plain water. If you intend adding salt to the horse's water, do not exceed 30g of salt per 5 litres of water and always provide separate plain water.

### SEVERE DEHYDRATION REQUIRES PROFESSIONAL CARE

Severe dehydration and electrolyte loss needs to be treated aggressively with urgent veterinary attention and oral and intravenous fluids. Dosing severely dehydrated horses with electrolyte pastes causes water to leave the cells and move into the gut, drawn to the Na from the paste. This worsens dehydration and is a sadly, not unknown cause of collapse and death in exercising horses.



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### PINCH TEST

A simple pinch test of the skin over the shoulder blade and checking the gums' moistness and refill time will help assess the presence of dehydration. If the skin is slow to rebound, dehydration is developing. To check gum refill, PPE and gloves are required. Then press your finger against your horse's gums and release quickly – the spot will be whitish from the pressure but should return to pink within two seconds. If it takes longer, dehydration is present.



Water makes up slightly more than 65% of a horse's body weight – so a 550kg horse is around 350 litres of water, dissolved in which is 1kg of salt! The aim of electrolyte/salt supplementation is to stimulate drinking and rehydration and to partially restore electrolyte imbalances. Always remember that Na triggers thirst (that's why we're always thirsty after eating salty food!) and therefore a horse with reduced body sodium doesn't feel thirsty – even if it's dehydrated!

### PREMATURE FATIGUE

If a horse is reluctant to drink seek veterinary support as there is a risk of serious medical problems during or after exercise, including impaction colic, gut stasis, 'thumps' (synchronous diaphragmatic flutter), muscle cramping, and 'tying-up' (exertional myopathy). For horses undertaking sustained exercise (endurance riding, eventing), dehydration and electrolyte loss contribute to the development of premature fatigue. The worst-case scenario involves development of the 'exhausted horse syndrome,' a life-threatening medical emergency associated with severe fluid and electrolyte loss, glycogen depletion, and overheating.

Regardless of the type of work your horse does, electrolyte losses over and above those provided in the daily feed should always be replaced soon after exercise. If not done, it can take up to three days for the horse to obtain enough salt from the daily feed to replenish its levels and it will look 'tucked up' because of dehydration.

### WATER INTAKE

Water intake for a 500kg horse is 25-30 litres a day. When rehydrating they may drink upwards of 50 litres a day – but if this is accompanied by excess urination, then you're probably feeding too much salt.

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