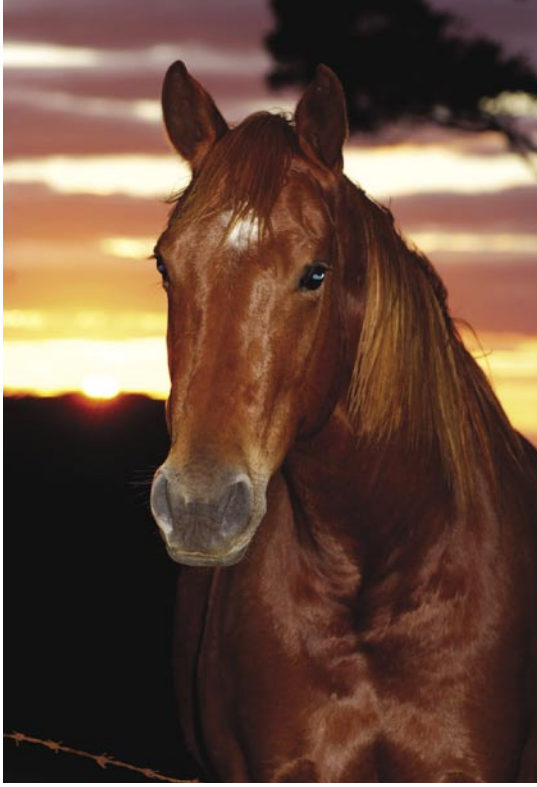
Magnesium for Horses

By Pauline Moore



Why do horses need supplemental magnesium?

Magnesium is needed directly for over 350 biochemical processes within the body, and is additionally involved in thousands of others. Magnesium is vital for energy production, metabolism of other minerals, regulation of blood sugars, maintaining normal muscle and nerve function, and maintaining strength of bones and teeth.

The majority of readily available horse feeds and forages are grown commercially with the help of fertilizers that contain little or no magnesium. Over time, soils become depleted of magnesium and some other minerals, which are then not available for uptake by the growing plants. The result is an over-abundance of minerals such as phosphorous and potassium and a deficit of magnesium. Some legume forages such as lucerne and clover are naturally high in calcium but will be low in magnesium if grown in magnesium deficient soils.

High levels of calcium, phosphorous or potassium inhibit absorption of the small amount of magnesium which may be present in the forage. Many areas of Australia have naturally acidic soils with low magnesium levels; horses grazing such pastures will be likely to need supplemental magnesium.

Ideally, horses need vast areas of low-sugar native pastures on which to freely roam in their daily hunt for feed and water. The reality is that domestic horses are frequently kept on pastures that were previously used for dairying and/or cattle production. These pastures were often 'improved' by the addition of imported grass species which can accumulate a very high sugar content, suitable for achieving high milk yields and rapid growth in cattle.

It has been well documented that the equine digestive system is not adapted to processing large amounts of sugar or non-structural carbohydrates (NSC). Horses grazing high NSC pastures become susceptible to blood sugar disorders such as insulin resistance, which can result in footsoreness or laminitis and poor hoof quality. High levels of blood glucose, from a diet high in sugar/NSC, increases the body's need for magnesium but at the same time will cause magnesium to be excreted through the kidneys and urine, thus magnifying any existing dietary magnesium deficiency.

Many horse owners have been forced to remove their horses from all pasture, or at least have grazing limited to one or two hours per day. Some have established a 'track' system where a narrow track around the perimeter of a paddock is fenced off, and most of the grass either killed or grazed down to virtually nothing. This has been an expensive and time consuming solution as pasture must be replaced by hay.

It has now been found that some horses are able to remain permanently on pasture with no restrictions to grazing, even those highly prone to laminitis. This has been achieved by feeding magnesium to those horses in sufficient amounts to counteract the effects of a high sugar intake.

As well as a high consumption of sugar, stress of any kind will cause large amounts of magnesium to be excreted. This would include travel, changed living or herd environment, extremes of heat and cold, injury, pain, and even the physical exertion of exercise. Very few domestic horses would consume enough magnesium from pasture or feeds to meet their daily needs, and have sufficient magnesium stored in body reserves to counter the amount lost each day.

What are the signs of magnesium deficiency?

As magnesium is needed for such a wide range of body processes, deficiency signs can present in an equally wide range of ways. Ten horses living in the same paddock may show signs of magnesium deficiency in ten different ways, influenced by individual genetic traits that govern how much magnesium can be absorbed and how much is excreted.

Some common signs of magnesium deficiency can include:

- Nervous, anxious temperament
- Sudden shying at familiar objects
- Violent pulling-back when tied
- Dislike of grooming
- Aggression towards owners or herdmates
- Separation anxiety, herdbound
- Restless under saddle, unable to focus on rider
- Bucking
- Poor hoof quality, footsore without shoes or boots on hard or rough ground
- Toe-first hoof landing in movement
- Laminitis
- Grass belly
- Insulin resistant with heavy crest
- Stiff, braced posture with deep 'V' behind withers
- Front feet placed far back under body when resting
- Tight, sloping croup
- Stifle catch
- Tying-up
- Excessive sweating in hot weather, shivering in warm, wet weather
- Dry, flaky skin
- Sweet-Itch, Qld Itch
- Watery eyes

How should magnesium be given to horses?

Many different forms of magnesium are available for horses, ranging from very expensive chelated organic

magnesium products to cheap inorganic raw materials.

Magnesium chloride is a very good source of magnesium as it is easily absorbed by the body. Other forms of magnesium, such as magnesium oxide, magnesium hydroxide and others, must be broken down in the stomach by hydrochloric acid to form magnesium chloride. Feeding magnesium chloride eliminates the need for break-down in the stomach which results in a much higher absorption rate. A study was done to compare absorption rates of various types of magnesium supplements; it was found that magnesium chloride had a high bioavailability rate, similar to the chelated supplements magnesium lactate and magnesium aspartate.

It is suggested that magnesium chloride be used for horses as the main source of supplemental magnesium for cellular uptake. There is also some benefit in feeding a small amount of magnesium oxide at the same time (40g per feed, introduced slowly, has been used with good results), especially for horses grazing fructan-rich grasses, commonly found in the southern regions of Australia.

Fructan is not digested in the small intestine as are other sugars, so will be deposited into the caecum where it may cause a rapid drop in pH. The large portion of alkaline magnesium oxide that cannot be absorbed through the small intestine is then available to assist in limiting the caecal acidosis which is associated with laminitis.

What is Magnesium Chloride Hexahydrate ($MgCl_2.6H_20$) ?

The white crystalline flakes of magnesium chloride hexahydrate are produced from evaporated, naturally-occurring saltwater from which sodium has been removed. Raw material sources include the pure waters of high-altitude salt lakes or deep underground salt deposits, both of which are remnants of prehistoric inland seas.

The magnesium chloride hexahydrate flakes referred to in this article contain 156mg of elemental magnesium per one gram of flakes, and were obtained from Elektra Life Pty Ltd (www.elektralife.com)

How should it be used?

All forms of dry magnesium chloride are bitter-tasting and likely to be unpalatable for most horses. The unpleasant taste can be masked by dissolving the flakes in water before mixing into a feed. The flakes dissolve quickly in hot water but will also dissolve in cold water. A convenient way to prepare the magnesium chloride solution is fill a large bottle with a measured amount of water, add an appropriate number of tablespoons of flakes, shake well and leave to dissolve. The solution does not need to be prepared fresh each day so a bottle may last several days, depending on the number of horses being fed and the desired strength of the solution.

How much should be fed?

There is no rigid rule that determines how much supplemental magnesium is needed by any individual horse. Just as every person has a need for magnesium that is likely to be different to other people, every horse is also likely to have individual needs.

Failure to provide sufficient magnesium for the horse's daily needs will result initially in a small daily gap between need and intake, which may not be noticed. The daily gap will progressively expand to a whole-body deficit, which may result in negative consequences for the horse's longterm health and soundness.

As a general guide, it is suggested that the strength of the magnesium chloride solution should be slowly increased over a couple of months until a slight softening of the manure is observed. When that point is reached, reduce the amount of magnesium chloride being fed to the previous level. Maintain at this lower level until a known increased need arises, for example, impending travel, competition or increase in sugar intake.

Any major changes in weather will have an impact on sugar levels in pasture grasses. Periods of overcast, cloudy, weather will usually result in lower levels of sugar in pasture grasses which reduces need for magnesium; a softening of manure consistency may be noticed during this time, indicating magnesium supplementation can be temporarily reduced.

Sugar levels will increase rapidly with the return of warm, sunny conditions so magnesium should be increased before deficiency signs are obvious. For laminitis-prone horses, delays of even a day or two may result in damage to the lamina that can take weeks or months to repair.

Similarly, during drought conditions when there is almost no grass available for grazing, sugars may be very high in what little grass is left. The total volume of sugar consumed may be low, due to most of the grass already having been eaten down, but when rain does return the rapid growth of new shoots will very quickly increase the volume of sugar being ingested. Under these conditions, It is advisable to increase magnesium on the day it starts raining, not waiting for the new shoots to appear a couple of days later.

It is important that the sugar and starch content of any hard feeds should be kept as low as possible at all times. Magnesium cannot be expected to compensate for the high levels of sugar and starch found in grains, cereals, molasses and other sweetfeeds. Similarly, any hay being fed should ideally be low-sugar grass hay, although this can frequently be difficult to obtain.

Some horses may do well permanently on the weakest starting solution of magnesium chloride, others living in the same paddock may need a much stronger solution. Many horses do quite well on the equivalent of 15g to 30g of dry flakes per feed, given twice daily.

Suggested Use:

Step 1

Dissolve 15g (1 tbsp) flakes in 150ml water and add 10ml of the resulting solution to each feed, preferably twice daily. Increase by another 10ml every 2 or 3 days until 50ml is being added to each feed. Starting with this very weak solution allows the horse's body time to adjust to a new source of magnesium. Increasing quantity or strength too quickly may cause scouring.

Step 2

Slowly increase the strength of the solution by increasing the quantity of flakes being dissolved, again increasing the amount given to the horse by 10ml every 2 or 3 days. Some easy-keeper type horses grazing lush pastures have

been found to need the equivalent of 60g of dry flakes per day, split over two feeds. Other horses may need much less than that, still others may need much more.

Step 3

Continue slowly increasing the strength of the solution over a period of some six weeks or so, or until a slight softening of the manure is noticed. When this happens, reduce the amount of magnesium chloride fed each day to the previous level, then maintain at this level.

If a softening of the manure is again noticed after already having reduced the amount of magnesium chloride being fed, this may indicate the horse's body stores of magnesium are being well replenished, so the amount of magnesium can again be reduced. It may also indicate the horse's daily needs have reduced, even if only temporarily. Lower sugar content of pasture or hay will reduce need for magnesium, for example. The horse should then be observed closely for any signs of returning magnesium deficiency so that the dosage rate can be adjusted back up if necessary.

When body stores of magnesium have been replenished, it should be possible to reduce the amount fed. As the body can only absorb so much at a time, this may take many months or even a year or two and will depend on the quantity of high-sugar feeds ingested, how much magnesium is excreted and the needs of each individual horse. Body stores of magnesium cannot be assessed by blood test as only around 1% of body magnesium is found in the blood. Cessation of deficiency signs has been found to be the only reliable way to determine that any individual horse is receiving an adequate daily supply of magnesium from all sources.

How long does it take to work?

The first changes to a quieter, calmer temperament are often seen within a week, with progressive improvements continuing over a couple of months. For laminitis horses, improvements in hoof form and function can take several months to be consistent as the new stronger lamellar connection grows down from the coronet, although improvements in foot comfort can often be seen within a month. Overweight or insulin resistant horses have been seen to lose their grass belly within a month – many of these horses also benefit from receiving a small amount of supplemental chromium. Relaxation of a stiff, braced posture usually occurs after a couple of weeks.

Feeding magnesium twice per day has been found to produce better results than feeding just once per day as the horse is able to absorb a higher overall daily amount. For severe problems, an introductory period of feeding small amounts of magnesium throughout the day may be beneficial, providing there is no intestinal disruption.

What about calcium?

Horses need the full range of minerals in order to be optimally healthy. National Research Council 2007 Nutrient Requirements of Horses lists the maintenance needs of calcium: magnesium for an average 500kg horse in a 2.7:1 ratio. For a horse living a perfect stress-free life in a nutritionally perfect environment, that could be true.

Taking into account the large amount of magnesium loss from a high level of sugar/NSC intake and/or the inevitable stress of living in a confusing human world, presents a very different need. Previously, it has been thought that a high intake of magnesium without calcium would cause the bone loss of osteoporosis. Radiographs of a horse who had received large amounts of magnesium with no calcium for many years, showed excellent bone density with no signs of any bone loss. Conversely, radiographs of a horse who had not been given magnesium showed significant bone loss.

Recent research published in the British Medical Journal (May 2010) and the American Journal of Clinical Nutrition (Aug 2010) suggest that calcium supplementation as previously recommended may not be protective against bone loss, and may be harmful. Some physicians are now recommending people should consume calcium: magnesium in a 1:2 ratio, the exact opposite of traditional suggestions, and preferably from food sources. Others are advising their patients to avoid all calcium supplements and to limit food sources of calcium.

Is magnesium safe?

Many reference sources for both humans and animals indicate that magnesium is not toxic; it is found in abundant quantities throughout the body. The major sign of excess dietary magnesium is diarrhoea or scouring.

Too much magnesium of any form is not desirable but even small amounts of some forms of magnesium, for example magnesium sulphate (Epsom salts) can cause scouring as it acts as an irritant to the intestinal lining. Scouring can also be caused by increasing the strength of the magnesium chloride solution too quickly; as with any new feed, the horse's body needs time to adjust. If this happens, reduce the amount fed for a few days, or even skip entirely for a couple of days, then start again at a much lower level, working up more gradually. Stool consistency is considered to be a reliable indicator of magnesium need: If the stool is normal, it is unlikely that too much magnesium is being fed, regardless of the amount being given.

Important: Supplemental minerals, including magnesium, should not be fed to any horse with existing renal problems. Consult a veterinarian for advice before feeding any minerals to any horse with suspected kidney function issues.

Note: This information is intended for educational purposes only. A veterinarian should be consulted for advice on any health concerns.

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