

Forageplus Talk discusses how you use of Acetyl-L-Carnitine with horses. What is Acetyl-L-Carnitine? When should you feed Acetyl-L-Carnitine and which horses will benefit from this supplement?



L-carnitine is a compound found in the horse's body. Two essential amino acids, lysine and methionine serve as primary substrates for its biosynthesis. Interestingly analysis of the nutritional and mineral amounts in forage, commonly found in Europe and the UK, indicate that methionine and lysine are often short due to incorrect ratios between sulphur and nitrogen. It stands to reason then that this important compound might well be short in the diets of certain horses and needs supplementing through the addition of acetyl-L-carnitine in the horses daily diet.. L-carnitine is very important for transporting fats, to be used as fuel, from the cytoplasm of cells into the mitochondria. Mitochondria are the cell's power producers. They convert energy into forms that are usable by the cell. This short video will help you understand more about the mitochondria.

## EPSM, AMPK and Acetyl-L-Carnitine

Acetyl-L-carnitine can activate an enzyme called AMPK. AMPK is the master metabolic regulator in cells. The role of AMPK in regulating cellular energy charge places this

enzyme at a central control point in maintaining energy homeostasis. This is why Acetyl-L-Carnitine is a helpful supplement for horses with EPSM (Equine Polysaccharide Storage Myopathy). EPSM horses have a genetic mutation in an enzyme, glycogen synthase 1, which causes this enzyme to be more active than normal. This results in abnormal glycogen levels in the muscle cells. These horses have fewer mitochondria so they need a very stable supply of glucose for the cells to function. Turning on AMPK stimulates the production of mitochondria, encourages burning of fats and directs glucose away from glycogen formation and to the mitochondria to be burned. A standard treatment for EPSM horses is using high levels of fat in the diet, however this can be harmful over a period of time as high fat diets in horses have been shown to increase the chance of the development of insulin resistance and laminitis. The supplementation of just 10 grams of acetyl-L-carnitine per day for a 500 kg horse has been found to improve symptoms so that fat in the diet can be reduced or eliminated, apart from the inclusion of omega-3 fatty acids from linseed during the winter or for horses not on green and growing pasture.

## Performance Horses and Acetyl-L-Carnitine

The fact forage analysis reports often show low levels of the components needed for L-carnitine synthesis may mean that many horses in moderate to heavy work, or just starting training, will benefit from the inclusion of this compound in their diet. Intensive exercise greatly increases the demand on muscle tissue to produce energy from glucose, stored glucose (glycogen) and fat. Acetyl-L-carnitine will help the horse adapt to training more quickly, reduce muscle soreness and stiffness allowing quicker recovery times.

Many of the benefits are likely to be due to the higher acetyl-L-carnitine levels that result when L-carnitine is supplemented. The effects of acetyl-L-carnitine in increasing flow of fuels to the mitochondria and encouraging production of mitochondria are also effects of training.

## Insulin Resistance and Acetyl-L-Carnitine

L-carnitine has been documented to improve glucose tolerance/insulin resistance in ponies:

Increased plasma leptin through l-carnitine supplementation is associated with an enhanced glucose tolerance in healthy ponies. *J Anim Physiol Anim Nutr (Berl)*. 2009 Apr;93(2):203-8. doi: 10.1111/j.1439-0396.2008.00807.x. Van Weyenberg S, Buyse J, Janssens GP.

Source Ghent University, Merelbeke, Belgium.

Stephanie.VanWeyenberg@Ugent.be Abstract In this study 0 or 4 g of l-carnitine was supplemented for 7 days in a cross-over design of six healthy ponies to modulate glucose metabolism and leptin production. At the end of each period, serial blood samples were taken to measure glucose and insulin response, leptin, triglyceride (TG), non-esterified fatty acids (NEFA) and creatine phosphokinase. l-carnitine supplementation was associated with a decrease in postprandial plasma glucose and insulin concentration, indicating an enhanced glucose tolerance. In contrast, postprandial plasma leptin concentration was increased when l-carnitine was supplemented. Yet, this increase in leptin concentration was not preceded by an increase in insulin concentration, suggesting that other factors apart from plasma insulin concentration could influence plasma leptin concentration. Although NEFA and TG were not significantly influenced by l-carnitine supplementation under these experimental conditions, further research must clarify whether net TG synthesis might be responsible for this increase in leptin.

The support in IR horses and ponies can be shown by reduced crest size and the reduction of abnormal fatty deposits, although of course, other management of horses like this is extremely important. An additional benefit which has also been documented has been the way L-carnitine naturally helps the body with the neuropathic pain which often accompanies cases of chronic laminitis. Neuropathic pain is where the nervous system has changed so that it fires inappropriately, becoming highly sensitive to any stimuli.

Supporting the body manage this kind of chronic pain has been observed, in people, to be highly successful with L-carnitine supplementation. In horses it is one method which can help recovering lamintics by encouraging natural nerve regeneration and supporting the

bodies ability to block the painful stimuli.

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