



VITA-E-PLUS

Powerful Antioxidant Formula

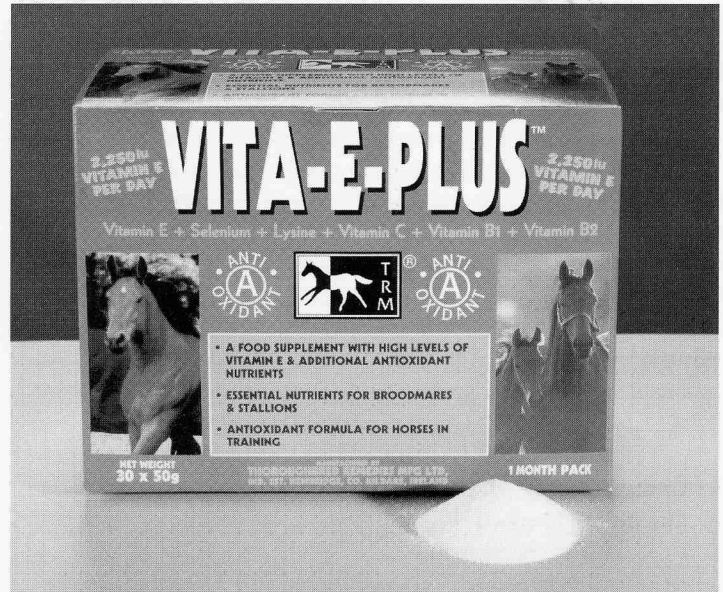


VITA - E - PLUS contains essential nutrients for all performance horses. VITA - E - PLUS is a powerful antioxidant formula. VITA - E - PLUS combines the antioxidant benefits of vitamin E, vitamin C and selenium together with the muscle protecting properties of vitamin B1, vitamin B2 and the essential amino acid lysine.

Anyone involved in horses will appreciate the large amount of time and effort that is required to keep these vulnerable animals sound and well conditioned. Equine physical conditioning and equine nutrition have received much attention from scientists during the last twenty years. However, few researchers have undertaken qualitative research to investigate if any links exist between physical soundness and nutrition. Many veterinary books on equine disease lack clear information, on the pathogenesis of exertional myopathies such as 'tying-up' syndrome. Muscle disease or degeneration will result in reduced performance. Low intensity training or genetic factors may help preserve physical soundness. However, problems such as exertional myopathies may still occur. Clearly, nutrition has a role to play in exercise physiology. VITA - E - PLUS is an ideal feed supplement for horses in training. VITA - E - PLUS contains essential nutrients which help protect muscle tissue during periods of training and competition.

Antioxidation & Oxidation

Before one can understand the concept of antioxidation, one must first grasp a true understanding of the metabolic process called oxidation. Oxidation is a metabolic process whereby oxygen is reduced to carbon dioxide and water. The oxidative process is fundamental in aerobic respiration where chemical energy is released from food using oxygen (this same energy is used for muscle contractions during exercise). During this process, toxic chemicals termed free radicals are produced. These free radicals can damage living cells by attacking the body's structural and functional components. The body must have an 'antioxidant defence mechanism' to protect it from oxidation induced damage. Selenium, vitamin E and vitamin C function as major components of this defence mechanism. In the process of oxidising nutrients for energy, oxygen is used and



Presentation: Powder sachet 30 x 50g, 5kg & 10kg bucket

carbon dioxide, water and free radicals are produced. These free radicals damage living cells, notably their proteins and lipids. Unsaturated fatty acids, which are the major component of all cell membranes, are particularly susceptible. Oxidation is quite damaging to cell function particularly muscle cell function in the high performance horse. Antioxidants are nutrients that help prevent this oxidation-induced damage in the body.

OXIDATION DURING RESPIRATION



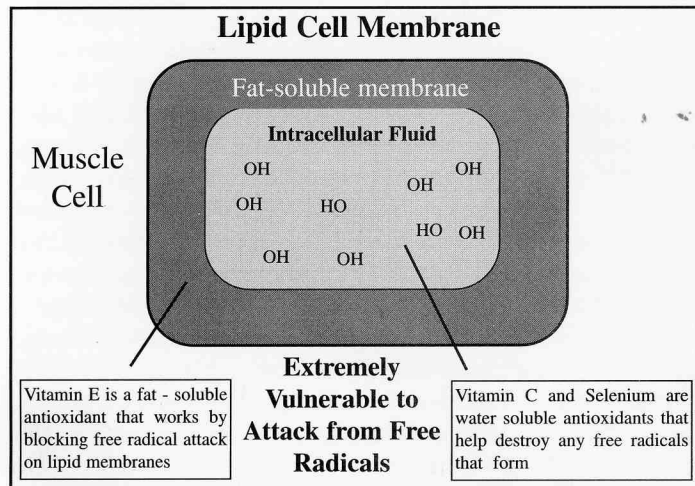
Oxygen + Glucose -----Carbon Dioxide + Water + Energy----Free Radicals

VITA - E - PLUS contains three potent antioxidant nutrients to help minimise damage to muscle cell membranes in the performance horse.

VITA - E - PLUS Nutrients:

Vitamin E is a fat soluble antioxidant vitamin which is freely available to horses at pasture. The best source of vitamin E is green forage. Vitamin E has a role to play in a number of functions in the mammalian body, amongst which are; neuromuscular function, immune function and reproductive function. In the performance horse, vitamin E has a further important role to play as an 'antioxidant defence mechanism'. Stabled horses in training are at risk of a vitamin E deficiency if they are fed a high grain / low forage ration. VITA - E - PLUS contains 2,250 iu of vitamin E per 50g daily serving.

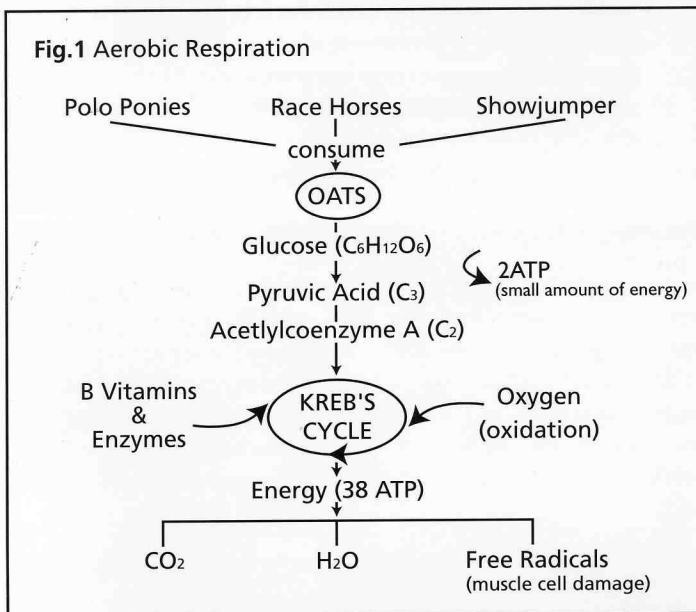
Vitamin C otherwise known as ascorbic acid, is a water soluble antioxidant vitamin. Vitamin C helps protect lipid cell membranes, fats and proteins from oxidation induced free radical damage. Vitamin C scavenges free radicals in aqueous solution, while vitamin E scavenges free radicals at the site of lipid cell membranes. Vitamin C is another component of the



body's 'antioxidant defence mechanism'. **VITA - E - PLUS** contains 2000mg of vitamin C per 50g daily serving.

Selenium is an essential trace element required in the equine diet. Selenium forms part of the antioxidant enzyme 'glutathione peroxidase'. This enzyme helps prevent the formation of free radicals and also destroys any lipid peroxides that are formed. Selenium is another component of equines' 'antioxidant defence mechanism'. **VITA - E - PLUS** contains 500mcg of selenium per 50g daily serving.

Vitamin B1 & B2 are involved in respiration - the release of chemical energy from food. Both vitamin B1 and vitamin B2 act as coenzymes during a phase of aerobic respiration termed **Krebs Cycle** (see Fig. 1). During this process, oxidation occurs and free radicals are produced. If vitamins B1 and B2 are scarce, or even marginally deficient, aerobic respiration will be inefficient. This will result in increased oxidation and an increase in free radical production. Therefore, vitamins B1 and B2 can be classified as 'muscle protecting' vitamins because of the role they play in oxidative phosphorylation.



Lysine is an essential amino acid. Therefore, the horse must acquire sufficient levels of this protein constituent from its diet. Research has found that lysine is the first limiting amino acid.¹ Lysine is required for growth of young stock and for protein turnover in athletic horses. Lysine is an essential nutrient for optimum athletic development and physiological well being. **VITA - E - PLUS** contains 10,000mg of lysine per 50g sachet.



Monday Morning Disease, 'Tying - up', Steadfast, Exertional Rhabdomyolysis, Azoturia, Myoglobinuria.

Classically the disease has been described in the draught horse following Sunday's day of rest, thus the name 'Monday Morning Disease'. In lighter breeds, such as the Thoroughbred, 'tying-up' also occurs in horses in training who are rested for a period of time, while being maintained on the same high grain diet. Sudden increases in exercise level may also be associated with this disease. This disease's pathogenesis is poorly defined. A variety of factors that result in metabolic alterations of the muscle mitochondrial function and electrolyte and fluid balance are involved. The explanation most often given is that a large amount of muscle glycogen stored during rest is metabolised to lactic acid faster than it can be removed during exercise. This results in levels of lactic acid high enough to cause muscle damage. However in one study, a high muscle, lactic acid concentration was only present in 4 of 12 affected horses.²

Typically, only fast twitch low oxidative muscle fibres are affected in horses with exertional myopathies. This would predispose the Thoroughbred and any horse involved in an anaerobic discipline to this condition, as they have a high quotient of these muscle fibres. Thoroughbred's have 35 - 40% fast twitch low oxidative muscle fibres.³

Clinical signs

Regardless of its pathogenesis, exertional myopathy most commonly occurs within a few minutes to an hour after beginning exercise following one or more days of rest, particularly when a high grain (greater than 40% of total diet) has been fed and the horse has had little or no exercise. In mild cases of exertional myopathy, there may be only a slight post-exercise stiffness, when running a shortened stride, or change of gait. In more severely affected horses, muscle cramping and fasciculations occur. The largest muscle masses are generally the most severely affected and are stiff, swollen and painful to touch. Although it is usually the gluteal and thigh muscles that are affected, the forelegs alone or in combination with other muscles maybe involved. Due to pain, affected animals often have a tucked up appearance, sweat profusely, have a stiff stilted gait, and are reluctant or unable to move. Muscle tremors, tachycardia and tachypnea can occur.

Muscle enzymes such as AST, LDH and CPK may be elevated in the blood due to muscle damage. CPK rises most rapidly (peaking within 4 - 12 hours of muscle damage) and will disappear first (1 - 2 days) if no further damage occurs. This is followed by LDH and finally AST, which peaks in 24 - 98 hours and may remain elevated for 2 - 4 weeks. LDH peaks about 12 - 24 hours after skeletal or cardiac muscle damage and returns to normal within 5 - 10 days if there is no further damage. Although CPK and AST elevations are proportional to the degree of muscle damage, they do not always reflect the severity of clinical signs. Myoglobin is typically excreted in urine. If sufficient quantities are excreted, it gives the urine a coffee-coloured appearance. In milder cases myoglobin in urine isn't overly evident, but may be detected using occult test reagent tablets. Recumbency or the appearance of dark coloured urine indicates a grave diagnosis.

Anything that increases muscle glycogen deposition or decreases circulation to the muscles, predisposes to the occurrence of exertional myopathy.

These include: 1) Genetic predisposition to any of these factors. 2) Poor physical conditioning 3) Poor circulation to muscle tissue 4) Over conditioning which increases the amount of glycogen stored in the muscle 5) High energy intake, particularly from cereal which increases muscle glycogen deposition 6) Failure to begin physical activity slowly i.e. failure to warm up.⁴ It appears that once an animal is affected, the more likely the condition will recur. Also nervous and hyperactive horses seem more prone to recurrent episodes. The underlying predisposition, as well as triggering factors can differ between groups of sufferers, therefore, the measures that may be successful in one individual may not be so successful in another sufferer. Diagnosis is usually based on clinical history and signs, together with plasma muscle enzyme activities. Treatment depends on the clinical severity but it aims to; a) limit further muscle damage b) decrease pain and anxiety c) restore fluid balance d) implement feeding and management practices to try and prevent a recurrence.

Feeding and Management Advice:

1. Antioxidants - One of the best procedures to initiate, is the supplementation of the antioxidant nutrients; vitamin E, vitamin C and selenium. Supplementing antioxidants is beneficial for both the treatment and prophylaxis of this multi-factorial condition. At the very least, it is very important to feed antioxidant vitamins after an episode of exertional rhabdomyolysis, to assist in the repair of damaged muscle tissue. It is good management practice to feed antioxidant nutrients to all horses in training for their '*muscle protecting properties*'.

2. Forage - The major proportion, if not all of the daily feed intake should be forage, either fresh pasture, hay or hay equivalents. It is preferable not to feed large quantities of alfalfa or legume-rich hays (as they are very energy dense).

3. Turn - Out - Do not turn horses' out into lush fast-growing pastures. It is important however, to initiate a program of daily turn-out in a sparse paddock for recurrent sufferers.

4. Hard Feed - If energy needs are not being met in individual horses by just forage alone, then supplement their diet with a high fibre / low carbohydrate concentrate mix

5. Supplemental Oil - Alternatively, supplement their diet with an oil or fat. Anywhere in the range of 10 - 20% of total diet is the ideal for sufferers. Vegetable oils are three times more energy dense than grain. For example, 500ml of corn oil yields the equivalent digestible energy as 3lbs of oats. Supplemental oils are very beneficial in the management of this syndrome as fats/oils do not lead to a build up of stored muscle glycogen. Another option is to feed an oil rich feed. It is very important to note that antioxidant nutrients must be fed in combination with supplemental oil to counteract oxidation damage caused by rancid oils.

6. Electrolytes - Electrolytes are very important in neuromuscular function. It is very important to ensure that all horses in training receive an adequate and balanced supply of sodium, calcium, chloride, potassium and magnesium.

7. Exercise - Initiate a regular exercise program without any complete rest days. Ensure the horse is adequately warmed up before hard work. If daily exercise is not possible, horses' should be turned out for as long as possible (remembering to avoid lush pastures) on rest days and any complementary feed reduced (halved) from the evening before until the evening afterwards.

Free radical Formation & Antioxidant Defence Mechanism

Normal compounds produce their chemical bonds by sharing pairs of electrons, one from each atom. Free radicals pick up another electron from normal compounds (typically oxygen) thus producing a stable product by pairing their unpaired electrons. But in doing so they alter the 'donor' compound and create another radical, since the process is still short one electron. In this way free radicals alter tissue proteins and lipids, causing cell damage and death. Free radical induced reactions tend to continue to produce unstable forms that go on to do further damage and release more free radicals. The most damaging free radical molecules are the superoxide anion (**O⁻**), the hydroxyl radical (**HO**), and the peroxide radical (**OH⁻**). Hydrogen peroxide (**H₂O₂**) while not a true radical, is unstable and is likely to be converted to the hydroxyl radical, which is the most potent oxidising agent known. So it too, must be converted by antioxidants to water. The free radicals superoxide, hydroxyl, peroxide radicals and hydrogen peroxide are detoxified by vitamin C and the enzymes glutathione peroxidase, superoxide dismutase and catalase in the water based areas of the cell. Vitamin E is fat-soluble and is found mainly in the lipid cell membranes and fatty structures of most cells. In adipose tissue, vitamin E is found in large quantities. Vitamin E detoxifies peroxides (OH), thus preventing the generation of even more toxic hydroxyl and superoxide radicals. Vitamin E works as an antioxidant by blocking free radical attacks on lipid cell membranes and thus helps to prevent the formation of lipid peroxides. Production of glutathione peroxidase for free radical scavenging depends on the availability of selenium. Selenocysteine is the active antioxidant portion of glutathione peroxidase. Because glutathione peroxidase is in the water based area of the cell, it can stop free radical reactions that would otherwise go on to attack lipid membranes, it tends to spare vitamin E by reducing its workload. Likewise since vitamin E conversion of free radicals prevents leaks or complete breakdowns of cell membranes, it spares glutathione peroxidase from having to convert free radicals that would otherwise invade the cell. This co-operation is the basis for the so-called sparing effects of vitamin E and selenium. Even with adequate vitamin E, some lipid peroxides form, but without adequate vitamin E even more will form. Vitamin C is a water soluble antioxidant vitamin therefore it functions mainly in the extracellular fluid. Selenium functions as an integral part of the intracellular enzyme glutathione peroxidase, which helps prevent the formation of free radicals and destroys any lipid peroxides that get passed the vitamin E defence and are released into the cell. Thus, the occurrence and extent of oxidation induced damage depends on;

- 1) Vitamin E.
- 2) Vitamin C.
- 3) Selenium containing glutathione peroxidase.

The antioxidants vitamin E, vitamin C and selenium convert free radicals to relatively stable compounds and stop or prevent the chain reaction of free radical damage. Inadequate amounts of these antioxidants result in a prohibitive amount of oxidation induced damage. This will affect the athletic potential of performance horses.

VITA - E - PLUS & The Stud Farm

Broodmares and growing stock have very high nutritional demands. During the last trimester of pregnancy and the first trimester of lactation, broodmares require twice the amount of



feed they would normally require during maintenance and early pregnancy. These additional calories, vitamins and minerals are needed for foetal development and growth. Once the foal is born the mare still has to initiate the colossal task of mammary gland milk production. These needs are met by increasing the amount of quality feed available to the broodmare. This additional feed brings us back to oxidative respiration (see fig.1) and krebs cycle. If the broodmare is metabolising twice the amount of feed, she is producing twice the amount of toxic free radicals. This in turn increases the need for antioxidant nutrients, namely vitamin E, selenium and vitamin C. The timeframe for all of this activity usually occurs during the winter months, a time when broodmares have very little access to green forage. Therefore, one must think about supplementing these important nutrients. Furthermore, both vitamin E and selenium deficiencies have been identified as pathogenic agents in certain foal disease. Nutritional myopathy, often accompanied by vascular disorders, particularly in newborn foals, and steatitis are the predominant forms occurring in foals. They occur as a result of inadequate selenium intake by the dam during pregnancy or inadequate selenium and/or vitamin E intake during lactation. Selenium, but not vitamin E is transferred across the placenta, and both are secreted into milk, being particularly high in the colostrum. However the amount of each transferred depends on how much of that nutrient is consumed by the mare.



The supplementation of **VITA - E - PLUS** will ensure that:

a) The broodmare does not give birth to a vitamin E and/or selenium deficient foal (this can have very serious consequences)

b) The broodmare will have little or no tissue damage (notably lipid cell membranes) from the release of toxic free radicals - powerful oxidising agents.

c) **VITA - E - PLUS** will reduce the potential risk of damage to uterine tissue. After all, the health of this tissue is fundamental for breeding back mares every season.

d) Feeding **VITA - E - PLUS** will considerably increase the chances of a healthy foal and a 'fertile' mare, which is the best any breeder can hope for.

Young growing stock will also benefit from the supplementation of **VITA - E - PLUS**. Weanlings and yearlings require good quality protein for muscular development and growth. Lysine has been identified as the first limiting amino acid in the equine diet as it is not readily available in most pastures. Yet this particular amino acid has been identified as

critical for the optimum development of young stock. **VITA - E - PLUS** contains 10 grams of lysine per 50g daily serving. The inclusion of vitamin C, vitamin B1 and B2 are particularly pertinent for young horses. Horses do not develop their hindgut 'fermentation' capacity until they are at least 2 years of age. This means that weanlings and yearlings are unable to produce their own vitamin C, B1 and B2. The net consequence of this will be inefficient respiration at a time when energy is required for massive growth spurts. **VITA - E - PLUS** cares for the growing horse.

Some Interesting Research Findings

Canadian veterinarians found that the breeding performance of mares and stallions improved considerably under the continuous administration of 2,000 iu of vitamin E per day.⁴

Karen Baalsrud studied the effect of vitamin E and selenium supplementation in relation to antibody response to pathogens. She discovered that the extra supplementation of these antioxidants significantly improved immune response in horses.⁶

Researchers in Germany noted that racehorses in training and racing over three racing seasons benefited from vitamin E supplementation. *"In comparison to the control group, supplemented horses achieved more victories and better places, they carried higher handicap weights, were less likely to experience a decrease of their general handicap, as well as higher average earning indices per horse and year"*⁸

VITA - E - PLUS is a unique supplement. The inclusion of antioxidant nutrients, lysine and vitamin B1 and B2 offers the horse owner a multitude of benefits for the overall health and nutritional status of their horses. What is even more significant, is that the antioxidant nutrients in **VITA - E - PLUS** could also help prevent certain nutritional myopathies in the newborn foal and the adult horse in training.

VITA - E - PLUS is a powerful antioxidant formula.

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Guaranteed Analysis	per 50g	per 1kg
Vitamin E	2,250iu	45,000iu
Vitamin C	2,000mg	40,000mg
Selenium	500mcg	10mg
Vitamin B1	500mg	10,000mg
Vitamin B2	100mg	2,000mg
Lysine	10,000mg	200,000mg

Feeding Instructions

VITA - E - PLUS should be added to the normal feed ration.

Horses in training: Feed 50g per day

Broodmares & Stallions: Feed 50g per day

Weanlings and Yearlings: Feed 25g per day

