



JUST WHAT ARE AMINO ACIDS?

A short description of what amino acids are and how supplementation with certain amino acids can assist in maximising the response to exercise training.

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JUST WHAT ARE AMINO ACIDS?

Amino acids are the building blocks from which proteins are made. Animals use amino acids from their diet to make proteins within the body. The body can create some amino acids, by conversion in the liver. However this process is limited and certain amino acids cannot be synthesised and must be obtained from the diet. These are the essential amino acids; isoleucine, leucine, methionine, phenylalanine, threonine, tryptophan and valine. Some additional amino acids; arginine, histidine and glutamine, are conditionally essential, and cannot be synthesised in sufficient amounts during stress such as growth or strenuous exercise training. These amino acids should be supplied in the diet at an increased level during stress.

In addition to the formation of proteins amino acids are involved in numerous other essential body functions. Amino acids are the precursors to neurotransmitters in the brain, are involved in energy production, hormone production and activation and they have antioxidant effects.

Exercise has a profound influence on the body, particularly affecting muscle growth and protein synthesis. Inadequate intake of amino acids in the diet will restrict muscle growth due to an insufficient supply of protein building blocks. Protein and amino acid supplements are very important for animals in training to maximise the benefits of exercise, particularly muscle growth, to stimulate natural hormone responses and to enhance energy metabolism.

A number of amino acids are of particular benefit to working animals. Here is a short description of how these amino acids can assist in maximising the benefits of exercise.





BRANCHED CHAIN AMINO ACIDS; VALINE, LEUCINE, ISOLEUCINE

The three branched chain amino acids valine, leucine and isoleucine make up one-third of muscle protein. During exercise increased muscle activity results in significant losses of these three branch chain amino acids (BCAAs). Increased intake of BCAAs will inhibit the breakdown of protein which occurs in exercising muscles which can improve performance, reduce fatigue and aid repair and recovery from intense exercise (Di Pasquale, 1997). Increased supply of BCAAs after exercise will significantly improve muscle RECOVERY so that muscles are ready to exercise again sooner. It is important to administer BCAAs within 30 minutes of completion of strenuous work or exercise. This is to take advantage of the window of opportunity that exists for increased uptake of BCAAs to enhance muscle RECOVERY.

CREATINE

CREATINE is an amino acid which is involved in energy supply to muscles. During exercise the initial energy supply to muscles is ATP, which releases energy as it is converted to ADP. CREATINE, as creatine phosphate, converts ADP back to ATP, so it can be reused. A contributing factor in the development of muscle fatigue is a deficiency of CREATINE. Supplementing with CREATINE increases the creatine content in muscles, particularly exercised muscles. High CREATINE levels, and thus increased ATP supply, prevents the muscle using glycolysis for energy and thus lactic acid production, associated with glycolysis, is reduced and the onset of muscle fatigue is delayed. CREATINE also enhances the body's ability to make the proteins used during muscle contraction and results in increased muscle density, size and strength. Studies have shown that CREATINE increases power output and total work output (Birch, R. et al 1994), increases sprint performance (Dawson, B. et al 1995) and increases in body mass (Balsom, P.D. et al 1993). Muscles may be loaded with CREATINE by administration twice daily for 5 to 10 days prior to the event.





CHROMIUM

CHROMIUM enhances the activity of insulin, insulin is vital to many body functions; most importantly in dealing with dietary sugar and in facilitating muscle growth (Colgan, M. 1993). Many diets are deficient in CHROMIUM and supplementation is vital for optimal muscular development. Supplementation with CHROMIUM has been shown, in scientific trials, to increase muscle weight gain and decrease body fat (Press, R.I. et al 1990, Page, T.G. et al 1991). Chromium picolinate is a unique form of CHROMIUM which is very well absorbed and completely safe.

ORNITHINE ALPHA KETOGLUTARATE

Ornithine alpha ketoglutarate (OAK) has a number of anabolic effects. OAK decreases muscle degradation and increases muscle synthesis (Vaubourdolle, M. et al 1991). OAK can act as a fuel source, thus sparing glucose. OAK acts as an ammonia scavenger to soak up ammonia which builds up during exercise (Colgan, M. 1993). OAK stimulates the release of growth hormone which has an anabolic effect (Cynobar, L et al 1990). OAK increases insulin release which also has an anabolic effect (Krassowski, J et al 1981). The body can make glutamine from OAK to replace muscle glutamine stores (Vaubourdolle, M. et al 1991). Muscles supply glutamine to the immune system at an increased level during strenuous training. This constant drain on muscle glutamine stores can result in deficiency and weakening of the immune system. Supplementing with OAK increases available glutamine and thus supports the immune system (Colgan, M. 1993). OAK is an essential but little known supplement for animals in strenuous training.

TRYPTOPHAN

Serotonin is a major neurotransmitter, a chemical involved in transferring messages within the brain. High serotonin levels result in a feeling of satiety and helps to induce feelings of relaxation and calm (Lehner, H. et al 1989). Serotonin is synthesised from TRYPTOPHAN and serotonin production depends on the availability of TRYPTOPHAN. Increasing TRYPTOPHAN levels can result in increased





serotonin production (Di Pasquale, 1997). If given before exercise TRYPTOPHAN can improve total work load, endurance and reduce ratings of perceived exertion (Segura, R. et al 1988). TRYPTOPHAN has been shown to increase athletic performance because of its effect on the opioid system which has a calming effect and results in increased pain tolerance. A number of co-factors are involved in both the absorption of TRYPTOPHAN and the ability of TRYPTOPHAN to increase serotonin levels. The effectiveness of supplementing with TRYPTOPHAN will be significantly enhanced by feeding TRYPTOPHAN together with its co-factors.

TYROSINE

TYROSINE is a precursor in the formation of catecholamine transmitters; adrenaline and noradrenaline (Rasmussen, D. 1983). These catecholamines have a stimulant effect on various body systems. TYROSINE is converted to noradrenaline which results in an improvement in mood and concentration, TYROSINE has been used to treat anxiety and depression (Gelenberg, A.J. et al 1983, Neri, D.F. et al 1995). TYROSINE plays an important role in the functioning of the adrenal gland, which is important in coping with stress, thus TYROSINE can help reduce the risk of overtraining. TYROSINE also stimulates the release of growth hormone which increases muscle growth and reduces body fat. Various cofactors of TYROSINE are essential for optimal absorption and functioning of TYROSINE within the body, these are vitamins B3 and B6, and zinc. Feeding TYROSINE together with its cofactors results in increased absorption and increased effect within the body.

PHENYLALANINE

The essential amino acid D-PHENYLALANINE inhibits the breakdown of opiate-like substances called encephalins in the brain, by reducing the activity of a brain enzyme called enkephalinase. Reduced breakdown results in an increased level of encephalins or endorphins in the brain. Endorphins are released in response to pain and act as natural pain killers to enable the body to cope with pain. L-Isoleucine and D-Leucine are also involved in the production of endorphins. The COMBINATION OF D-PHENYLALANINE, L-ISOLEUCINE AND D-LEUCINE, can assist in increasing endorphin production. An increase in brain endorphin levels can assist exercise performance by reducing pain associated with fatigue or injury.





RED CELL PRODUCTION

Athletic animals are frequently borderline anaemic and have low levels of haemoglobin. Haemoglobin is the red pigment in red blood cells which carries oxygen. Low haemoglobin means less oxygen to the muscles and less performance.

Exercising animals are low in iron and haemoglobin due to increased loss of red cells during exercise (Colgan, M 1993). During intense exercise there can be small amounts of blood lost into the gut and through the kidneys. Also red cells can be damaged during exercise, either crushed within intensively contracting muscles or within the feet which are constantly pounding the ground.

Exercising animals need to produce an increased number of red blood cells to replace those lost during exercise. In order to produce red cells the body needs more than just iron. IRON is essential for making haemoglobin however iron by itself does not increase red cell production.

A number of other nutrients must be given, together with iron, for red cells to be produced, these NUTRIENTS WORK IN SYNERGY TO ENHANCE RED BLOOD CELL PRODUCTION (Levander et al 1980). FOLIC ACID, ZINC, VITAMIN B12 are essential co-factors for making red cells (Colgan, M. 1993). PYROXIDINE is essential for the formation of haemoglobin (Baker, E.M. et al 1964) and for absorption of vitamin B12. VITAMIN C deficiency alone results in anaemia (Cox, E.V. 1966), additionally vitamin C is an anti-oxidant which protects folate from oxidation by free radicals (Stokes, P.L. et al 1975).

Unless the correct COMBINATION OF NUTRIENTS for red blood production are supplied to the athletic animals the ability to produce red cells can be reduced forever, resulting in a permanent reduction in performance.





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