

DOES DIET AFFECT BLOOD TESTS©

**Dr J H Stewart BVSc BSc PhD MRCVS Dip BEP AAIM
Equine Veterinarian and Consultant Nutritionist to Mitavite**

Because of the complex relationships between nutrients and the varied roles they have in the body, there are few nutrients that bear a simple relationship to findings on blood tests. There are thousands of pathways for nutrients once they have entered the body and because they have multiple roles in the body, any deficiencies will affect a number of systems. In addition, because blood levels of nutrients are kept within a narrow range, blood tests give no indication of whole-body status.

One widespread belief is that anaemia is common in horses. The PCV, haemoglobin and red cell count is used to assess the presence of anaemia. But, although sports-related iron deficiency anaemia can develop in human athletes, it has not been reported in horses - parasitism or intestinal ulceration are the most common causes of anaemia and iron deficiency the least common. PCV or haematocrit is determined by a number of factors, including breed, sex, temperament, training, disease and diet.

A low haemoglobin is usually attributed to iron deficiency, however, the only thing that causes haemoglobin to rise is the correct work program. Nutrients provide the raw materials to make haemoglobin, but insufficient or inappropriate work means no rise in haemoglobin. A strong, hard workout relative to the stage of preparation will destroy up to a gram of haemoglobin/100 ml of blood, so it is especially important to allow sufficient time to rebuild after a fast day. Putting too many fast days close together, can drop the haemoglobin. The aim of training is to stress the system so the bone marrow makes more haemoglobin to meet the workload. Intense work, without adequate nutritional support, can create a situation where the bone marrow production of new red cells cannot keep up due to a too-heavy work program or nutritional deficiencies. Copper deficiency creates an iron deficiency anaemia since it is required for transport of iron and incorporation into haemoglobin). Changes in red cell results may be due to blood loss (ulcers, bleeder); Vitamin B6, B12, E, Folic Acid, copper or niacin deficiencies, or gut upsets causing reduced production or absorption.

A low total white count and low lymphocyte percentage suggest a horse has been exposed to a virus, is showing the effects of chronic high stress or has been regularly receiving either corticosteroids or ACTH. If it's viral, it will reverse itself within about 2 weeks. If the changes persist, the horse may need a rest. Stress/cortisol/ACTH induced changes may also show up in the electrolyte profile - high sodium and low potassium are the classical changes. However, "normals" on blood test results can be just about worthless when talking about the racing thoroughbred. Because of the complex relationships between nutrients you often have to look deeper. If the sodium is upper normal, say 40% above the center of the normal range, but potassium is 40% below normal, the blood report may call both of these 'normal' values, but the pattern is abnormal. Falling levels of key antioxidants such as selenium and vitamins E and C is the link between overtraining and depressed immune function – which shows up on a blood test as electrolyte abnormalities, protein and white cell changes.

High stress, corticosteroids and ACTH often depresses thyroid function, which in turn can effect red cell parameters. Lacklustre performance, a dull attitude, poor appetite, muscular pain and/or low grade tying-up are common symptoms. Using the results of a single blood test in place of a full history and comprehensive veterinary clinical examination is unlikely to shed much light on performance problems.

Muscle and liver enzymes also bear complex relationships with the nutrients on which their structure depends. Indirectly, diet affects muscle function and elevated SGOT may occur secondary to imbalances in potassium, magnesium, calcium and B vitamin intake, antioxidant (vitamin E and selenium) deficiency and insufficient high quality protein. The anti-oxidant systems are dependent upon vitamin E, selenium and copper. But although body selenium status is reflected by blood levels, testing for vitamin E levels is costly and blood copper levels give no indication of whole body status, because reserves of copper are held in the liver.

It is not uncommon to find mild elevations in GGT, an enzyme used as a marker for liver damage. However, such elevations indicate incorrect feeding management, not poor feed. The reason for this is that, unlike humans, horses do not have a gall bladder – instead the bile flows directly from the liver in response to food entering the stomach. If horses do not have constant access to food – as commonly occurs overnight – the bile banks up in the liver, leading to a mild elevation in GGT. This is not pathological. It is frequently blamed on the ‘feed’ but such an assumption prevents recognition of the true cause ie, a feeding management problem. To confirm this, a second blood sample should be taken after feeding and if the GGT is normal, closer more attention needs to be paid to ensuring horses have constant access to roughage.

GGT is also a participant in the muscle anti-oxidative system. Rather than being an indicator of liver damage, GGT may be an indicator of ongoing adaptation to exercise - an indicator that the training schedule is doing some good. Elevated GGT levels can also indicate oxidant damage and insufficient zinc, vitamin E selenium and vitamin C.

The body’s regulation of blood levels of nutrients may preclude finding simple relationships between blood test results and diet. Deficiencies of protein, sodium, potassium, magnesium, phosphorus, copper, manganese selenium, zinc and vitamins A, B1 and E may cause a decrease in their blood concentration. However, imbalances in body levels may be present without changes in the blood levels. Also, a dietary imbalance has to be quite prolonged before it is reflected by changes in the blood.

The best protection against deficiencies is a correct diet. Evaluation of the diet is the easiest and the best way to diagnose and correct many nutrient imbalances, before they impact on performance. Total reliance on blood test results can be misleading and subject to errors arising from sampling, transport analysis and interpretation, which is why *Mitavite* provides a complete diet analysis service and specialised feeds with the correct profile and balance of nutrients to meet the demands of intense work and racing. For further information on Mitavite feeds, contact Mitavite on 1800 025 487 www.mitavite.com.au