

Blood Tests

Your horse may have a blood sample taken for a number of reasons, including illness, monitoring response to treatment and general health or fitness checks. Blood can be tested for many different substances. This guide aims to explain what things are being measured and what abnormal results may mean.

Reference ranges are often supplied, indicating the normal values of measurement for a horse. These values are often for the average horse so naturally some horses will fall outside these brackets without any significance. Results should all be interpreted with reference to the other results as many of the things measured have direct effects on one another.

Red Blood Cells

A number of measurements can be made with regard to red blood cells (erythrocytes) in the horse:

Packed Cell Volume (PCV) – This is the percentage of the blood that is made up of red blood cells. This figure can vary from as low as 24% up to 48%.

Red Blood Cell (RBC) Count – This is the number of red blood cells in a given volume, typically 1 litre, of blood.

A low PCV and RBC count normally indicate anaemia. Anaemia may be caused by blood loss, such as trauma or bleeding into the gastrointestinal tract, immune mediated disease, various infections, some cancers or many other conditions. Your horse may show signs of anaemia such as weakness, dullness, reduced appetite or reduced exercise tolerance.

An increase in PCV and RBC count may be due to several factors. It usually means either that the horse is dehydrated or that the horse has been 'wound up' prior to taking the blood sample. In these cases the spleen contracts, releasing more red blood cells into the circulation. Rarely, other conditions can cause an increase in the PCV and RBC count.

Mean Corpuscular Volume (MCV) – This is the average volume of each red blood cell sampled. Differences in the average red blood cell volume explain why the PCV and RBC count do not always match. This can also be used to help identify causes of anaemia.

Mean Corpuscular Haemoglobin (MCH) – This is the average amount of haemoglobin in each red blood cell.

Mean Corpuscular Haemoglobin Concentration (MCHC) – This is the amount of haemoglobin in the circulating blood.

Haemoglobin is the substance in red blood cells that allows them to carry oxygen around the body. These measurements can be useful in identifying causes of anaemia or in identifying mineral deficiencies, such as iron deficiency.

White Blood Cells

There are five different types of white blood cells (leukocytes) in the horse. The number of these different cells in the blood, and their numbers with reference to one another can give us a lot of information about your horse's wellbeing.

White Blood Cell Count (WCC) – This is the total number of white blood cells in the blood. Increases in the WCC (leukocytosis) are most commonly a result of bacterial or viral infection, stress, drug administration or immune mediated disease. A decrease in the total numbers of white blood cells (leukopaenia) may be due to overwhelming bacterial or viral infection, bone marrow disease or endotoxaemia.

Neutrophils – These are the most common white blood cells in the horse. They move rapidly to sites of infection or inflammation within the body. A low number of neutrophils (neutropaenia) is most often a result of an increase in demand for them. Where there has been a sudden infectious or inflammatory process the neutrophils in the blood may have been used up in dealing with this. There is a natural delay whilst the body adapts to this by synthesising and releasing more neutrophils. Failure of neutrophil production and endotoxaemia may also lead to neutropaenia. Neutrophilia is an increase in the numbers of circulating neutrophils. This is most often due to bacterial or viral infection, injury, stress or drug administration. Some bone marrow conditions may result in overproduction of neutrophils and thus a neutrophilia.

Monocytes – These cells are important in the breakdown of damaged tissues and the destruction of microbes. An increase in monocyte numbers (monocytosis) may indicate bacterial infection, chronic inflammation or stress. Monocytosis may also be seen during the recovery phase following viral infection. Monocytopenia, low numbers of circulating monocytes, is not clinically significant as no monocytes may be found in the examination of blood from clinically normal horses.

Eosinophils – These cells are most commonly associated with parasitic disease and with allergic conditions. Increased numbers (eosinophilia) may be due to parasitism (although this is not always seen in these cases) or hypersensitivity (allergic) reactions. As with monocytes, eosinophils are not always found in a blood sample from clinically normal horses so eosinopenia is not a significant finding.

Basophils – Basophils are rarely found in blood samples. When they are found in increased numbers (basophilia), this may indicate long standing allergic disease or ongoing recovery from colic.

Lymphocytes – These are the white blood cells with the greatest responsibility for managing the immune system. Lymphocytosis (increased numbers of lymphocytes) can be caused by excitement and exercise or some cancers. Lymphocytosis is a common incidental finding in young horses. Lymphopenia, reduced lymphocyte numbers, may be a result of stress, viral infection, severe and overwhelming bacterial infection or endotoxaemia.

Platelets

Platelets have a number of important functions such as blood clotting and the release of various beneficial chemicals at the site of injuries. Thrombocytopenia is a reduction in circulating platelets, often due to immune mediated disease causing platelet destruction. In some cases toxins or some cancers result in decreased platelet production from bone marrow. Rarely an increase in numbers of circulating platelets is seen. This is most commonly due to bacterial infection.

Biochemical Tests

Substances that are measured in a sample of your horse's blood may indicate the function of specific organs or metabolic pathways. As many substances can come from more than one source, results must be interpreted with caution and with careful reference to other results from the blood test.

Adrenocorticotrophic hormone (ACTH) – This hormone is tested for in the diagnosis and management of Cushing's disease. It is elevated in horses with uncontrolled Cushing's disease.

Alkaline Phosphatase (ALP) – Raised levels of ALP may indicate bone metabolism, intestinal malfunction or, most commonly, chronic liver disease. Reference ranges vary widely with age.

Aspartate aminotransferase (AST) – Elevated AST levels are seen in cases of acute liver or muscle damage. Levels peak 24 – 48 hours following injury and will return to normal 10 – 21 days following resolution. Combined with CK measurements, AST provides a useful measurement of muscle damage in cases of 'tying up'.

Bilirubin – Bilirubin, excreted from the liver in bile, may be increased in the horse in cases of anorexia or some liver conditions.

Bile acids – These are excreted as bile salts in the bile. Their measurement can be useful in assessing liver function.

Cortisol – Blood cortisol levels may be increased in horses with Cushing's disease or in stressed horses.

Creatine Kinase (CK) – CK occurs in high levels in skeletal and cardiac muscle. In the horse, increased levels almost always signify acute muscle damage. Levels peak 6 – 12 hours following injury and can return to normal levels in 3 – 4 days. CK is often assessed alongside AST when assessing muscle damage.

Creatinine – Creatinine is excreted from the blood by the kidneys. Increased levels of creatinine may be seen in horses with primary kidney disease or with other conditions affecting the kidneys such as dehydration, shock and post renal obstructions.

Gamma Glutamyl-transferase (GGT) – GGT is found in certain liver cells. Increased blood levels indicate liver disease. Following an increase in GGT levels, it can take several weeks for these levels to return to normal. Increases may also be seen in association with over training.

Glucose – Glucose is the source of the body's energy. It is measured in suspected cases of equine metabolic syndrome and sometimes in cases of equine Cushing's disease. Blood glucose may also be measured as part of a glucose tolerance test, assessing small intestinal function.

Glutamate Dehydrogenase (GLDH) – Raised GLDH levels are specific for acute liver disease. Following resolution of any liver injury, levels of GLDH return to normal within 24 hours, so may be a useful indicator of ongoing liver disease.

Insulin – This hormone may be tested for during investigation of equine metabolic syndrome, in which cases it is elevated. High insulin levels may be responsible for laminitic episodes in some horses and ponies.

Lactate – Lactate is constantly produced and broken down by the body. Blood lactate levels may be taken from horses with colic, where an increasing blood lactate concentration may indicate a worsening prognosis.

Lactate Dehydrogenase (LDH) – This enzyme is present in a number of tissues and must be separated into its different isoenzymes, which are linked to different organs. Dependant on the specific isoenzyme raised, elevated LDH may indicate liver, muscle or intestinal disease.

Protein - Total Protein (TP) – Total protein is a numerical value for the total mass of protein in a given volume of blood. Alterations in the total protein value may represent changes in the values of one or several of the proteins found in blood:

Albumin – Raised levels of albumin are almost always due to dehydration. When levels of albumin are low this suggests either a failure of protein production due to liver disease or protein loss. Protein can be lost from the body most commonly through the intestine or can be lost through the kidney.

Globulin – Globulin proteins carry out a number of tasks, including assisting with immune function. Total globulin is made up of three fractions, alpha, beta and gamma globulin. Levels of these fractions can be measured using a process called serum protein electrophoresis. Increased globulin levels may be seen when a horse is fighting an infection. When newborn foals have a blood test to ensure adequate colostrum transfer from the mare levels of gamma globulin are measured. When these levels are low this indicates inadequate transfer of immunity through the mare's colostrum and the foal may require transfusion of plasma with increased gamma globulin levels.

Inflammatory Proteins – Several proteins in horse blood may be measured to give information on inflammatory conditions. These include serum amyloid A (SAA) and fibrinogen. SAA rises quickly in response to inflammation or infection and will quickly return to normal levels following resolution of the inflammation or infection. Fibrinogen will rise in response to tissue damage. Fibrinogen rises slowly, reaching a peak after about 10 days and takes around 3 weeks to return to normal levels.

Triglycerides – Triglycerides are responsible for fat transport in the body. Raised triglyceride levels are commonly seen following a period of anorexia as body fat is mobilised for energy.

Urea – Urea is produced in the liver and excreted by the kidneys. Elevated levels may signify kidney disease but may also occur with dehydration or fasting.

Electrolytes

Calcium – In the blood the majority of this electrolyte is bound to albumin, so levels should be assessed with reference to albumin levels. Increased calcium levels may be seen in cases of kidney disease, some cancers and vitamin D poisoning. Low levels may be due to liver disease, inadequate intake or late pregnancy/lactation.

Chloride – This electrolyte is closely associated to sodium, and will usually mirror changes in this. Low chloride levels are commonly seen in horses following excessive sweating.

Phosphate – Low phosphate may be seen in horses with kidney disease or with low dietary phosphate intake. Low phosphate can be a normal finding in horses where the blood sample has been taken immediately after exercise.

Potassium – Very little of the body's potassium is in the blood, so changes in the blood potassium levels may not correlate with total body potassium. Low levels are due to potassium loss. This can be through intestine or kidney disease or through sweating. High levels may be an incidental finding when red blood cells have broken down (haemolysed) in the sample prior to testing or may be due to muscle damage.

Sodium – Low levels commonly indicate loss through excessive sweating, or through kidney or intestinal disease. Low levels may also be found in young foals with bladder damage. Increased sodium levels are usually a sign of dehydration.

If you have any questions regarding blood tests for your horse please call the clinic to speak to one of the vets.