



# Understanding Your Pet's Blood Work



When your pet has lab work done, we get a better picture of what is going on inside of your pet. The veterinarian gets information about your pet's red/white blood cells, as well as how some of the organs are functioning, such as the liver and kidneys. But what does all of it mean?

## Complete Blood Count (CBC)

A CBC will provide information about hydration status, anemia, infections, blood clotting ability, and the immune system's ability to respond. This test is part of routine lab work, but it is especially important in patients that are experiencing fevers, vomiting, diarrhea, weakness, pale gums, or loss of appetite. A CBC is important before surgical procedures, as it can detect unseen abnormalities within a pet.

## *Parameters within a CBC*

### Red Blood Cell (RBC) Parameters

- **RBC** - *red blood cell count* - Measures the amount of red blood cells in the body. Red blood cells are responsible for distributing oxygen throughout the body.
- **HCT** - *hematocrit* - Measures the percentage of red blood cells in the body. A high value can indicate dehydration, or in rare cases, a bone marrow disorder, causing the body to produce too many RBCs. A low value indicates anemia, blood loss, active bleeding or excessive red blood destruction due to toxins or immune disorders. In rare cases, a low value is seen in those with a bone marrow disorder, causing the body to produce too few RBCs.
- **HGB** - *hemoglobin* - Hemoglobin is a protein inside of the red blood cells that are responsible for carrying oxygen. This value measures the amount found in the body. High levels can indicate dehydration or a high RBC count. Low levels indicate anemia, bleeding, or low levels of iron.

- **MCV** - *mean cell volume* - Measures the average amount of RBCs in a sample. A high MCV can indicate the presence of larger than normal cells, which may be related to young cells during response to anemia. A low MCV indicates the presence of smaller than normal cells, which may be associated with chronic blood loss or iron deficiency.
- **MCH** - *mean cell hemoglobin* - Refers to the amount of hemoglobin in the red blood cells. High or low numbers may indicate a vitamin deficiency or certain types of anemia. A high value can also indicate hemolysis (destruction/rupture of red blood cells; this can sometimes happen during drawing of the sample).
- **MCHC** - *mean cell hemoglobin concentration* - Another measurement for determining the amount of hemoglobin in a red blood cell. High values can indicate hemolysis; low values can be seen due to anemia, or during blood loss.
- **RDW** - *red cell distribution width* - Measures the size and volume of red blood cells in a blood sample. An increased RDW means that there is too much variation in the size of the red blood cells; this value helps identify the cause of RBC issues. normocytic anemia, which is a type of anemia in which the size of RBCs is within the normal range. Chronic diseases such as chronic kidney disease, cancer, and inflammatory bowel disease can affect the production of RBCs and cause normocytic anemia and a low RDW value.
- **RETIC** - *reticulocytes* - Measures the amount of immature red blood cells in the body. This value helps determine if a pet's anemia is regenerative or non-regenerative; meaning the veterinarian can see if the body is responding appropriately to a decrease in red blood cells.

### White Blood Cell (WBC) Parameters

- **WBC** - *white blood cell count* - Measures the amount of white blood cells in the body. White blood cells are responsible for immunity, helping the body fight off infection and disease.
- **Leukocyte differential** - Various patterns of change in the following values may be seen with different types of inflammation, stress, excitement, and leukemia.
  - **NEU** - *neutrophils* - inflammatory cells associated with infectious and noninfectious disease processes. Neutrophils can be decreased in pets with bone marrow disease, some viral diseases, and in those receiving cancer chemotherapy drugs. Neutrophils are increased in pets with inflammation or infection of any part of the body and in pets receiving cortisone-type drugs.

- **LYM** - *lymphocytes* - immune cells highly responsive to stress and potentially increased during a chronic infection. Lymphocytes may be increased in puppies and kittens with an infection, and they can be decreased in severely stressed pets. Certain drugs, such as prednisone, will decrease the number of lymphocytes in the bloodstream.
- **MONO** - *monocytes* - Inflammatory cells associated with repair of tissue injury. Increased monocytes can indicate chronic inflammation/infection or cancer.
- **EOS** - *eosinophils* - inflammatory cells associated with parasitic disease, hypersensitivity, and allergies.
- **BASO** - *basophils* - Inflammatory cells associated with parasitic disease, hypersensitivity and allergies.

### Platelet Parameters

- **PLT** - *platelets* - Platelets are produced in the bone marrow and responsible for blood clotting. A platelet count can reveal thrombocytopenia (a condition where there are abnormally low levels of platelets in the blood), or thrombocytosis (a condition where there are abnormally high levels of platelets in the blood).
- **PCT** - *platelet crit* - a platelet index that measures the volume of platelets in the blood as a percentage of blood volume. Indicator of thrombocytopenia/thrombocytosis.
- **MPV** - *mean platelet volume* - a measurement of the average size of the platelets in the blood. This value is helpful when distinguishing between different causes of thrombocytopenia and thrombocytosis. An increased MPV indicates the presence of larger than normal platelets.
- **PDW** - *platelet distribution width* - a platelet index that measures the variation in size of platelets in a pet's blood. A high PDW can be a sign of vascular disease or certain cancers.

### Blood Chemistries

Blood chemistries evaluate the function of certain organs, electrolyte levels, and hormone levels. These tests are important for establishing base-line levels in healthy pets, and they are essential for evaluating the health of older pets, those with

vomiting/diarrhea, toxin exposure, pets receiving long term medications, and pre-anesthetic patients.

### **Kidney Values**

- **BUN** - *blood urea nitrogen* - Blood urea nitrogen is a waste product produced by the liver from proteins from the diet and is eliminated from the body by the kidneys. An increase in BUN can indicate decreased kidney function, dehydration, heart disease, shock, or urinary obstruction. An acute increase can be seen if a pet is fed a high protein diet. A decreased BUN can indicate overhydration, or liver disease.
- **CREA** - *creatinine* - A waste product that originates from muscles and is eliminated from the body by the kidneys. An elevation of creatinine is due to kidney disease or dehydration. CREA is not affected but a high protein diet. An increase in this level indicates overhydration. Both creatinine and BUN increase in the bloodstream at the same time in patients with kidney disease.
- **PHOS** - *phosphorus* - Phosphorus in the bloodstream originates from bones and is controlled by the PTH (parathyroid hormone), a hormone that regulates calcium and phosphorus levels in the blood through its effects on the kidneys, intestines, and bones. Elevations can be seen in patients with kidney disease; increases in growing puppies and kittens can be normal.
- **Ca+** - *calcium* - Originates in the bones and is also controlled by the PTH. A high Ca+ can be caused by a variety of factors including kidney disease, certain types of cancer, certain toxicities, and parathyroid disease. A low Ca+ can be seen with parathyroid disease, low albumin, and in females that are nursing.

### **Liver Values**

- **ALT** - *alanine aminotransferase* - an enzyme produced by liver cells. An increased ALT is an indicator of liver cell damage, but it does not indicate a cause.
- **ALKP** - *alkaline phosphatase* - originates from many tissues in the body; increases may indicate a liver abnormality (cholestasis - the flow of bile from the liver is reduced or stopped), Cushing's disease, active bone growth in young pets, and active bone remodeling after a bone injury. In cats, the most common reasons for increases are liver or bone disease. Some medications can also cause an increased value.

- **GGT** - *gamma glutamyl transferase* - an enzyme found in many organs, but primarily in the liver. Increased GGT indicates cholestasis, liver disease, or excessive use of corticosteroids.
- **ALB** - *albumin* - a small protein produced by the liver. Albumin acts as a sponge to hold water in the blood vessels. It is helpful in evaluating hydration, hemorrhage, and intestinal, liver, and kidney health. Increases in this value indicate dehydrations. A decreased albumin can occur with decreased liver function, blood loss, GI disease, or kidney disease.
- **TBIL** - *total bilirubin* - produced by the liver from old red blood cells. Bilirubin is further broken down and eliminated in both the urine and stool. Bilirubin is increased in the blood in patients with some types of liver disease, gallbladder disease, or when red blood cells are being destroyed at a faster than normal rate (hemolysis). Large amounts of bilirubin in the bloodstream will give a yellow color to non-furred parts of the body, which is called icterus or jaundice. This value also helps identify bile duct problems and certain types of anemia.
- **Bile acids** - Bile acids are produced by the liver and are involved in fat breakdown. A bile acid test is used to evaluate the function of the liver and the blood flow to the liver. Patients with abnormal blood flow to the liver, a condition known as portosystemic shunt, will have abnormal levels of bile acids. The bile acid test measures a fasting blood sample and a blood sample two hours after eating.

### Pancreas Values

- **AMYL** - *amylase* - An enzyme produced by the pancreas and the intestinal tract that helps the body break down sugars. Amylase may be increased in the blood in animals with inflammation (pancreatitis), kidney disease, GI disease, and certain drug treatments.
- **LIPA** - *lipase* - another pancreatic enzyme that is responsible for the breakdown of fats. Increases are seen with pancreatitis, kidney disease, GI disease, and certain drug treatments.

### Protein Profile

- **TP** - *total protein* - indicates hydration status and provides information about the liver, kidneys, and infectious diseases. An increased TP may indicate dehydration or an inflammatory condition. A decreased TP may indicate decreased liver function, blood loss, gastrointestinal loss, and decreased kidney function.

- **ALB** - *albumin* - a small protein produced by the liver. Albumin acts as a sponge to hold water in the blood vessels. It is helpful in evaluating hydration, hemorrhage, and intestinal, liver, and kidney health. Increases in this value indicate dehydrations. A decreased albumin can occur with decreased liver function, blood loss, GI disease, or kidney disease.
- **GLOB** - *globulin* - Globulins are proteins found in the blood, produced by the liver and the immune system. They play an important part in liver function, blood clotting, and fighting infections. Increases are seen with inflammation and potential chronic infection. Decreases are seen with blood loss, GI bleeding, and immune deficiencies.

### **Electrolyte Values**

- **Na+** - *sodium* - Increased sodium indicates dehydration. Decreased sodium can be seen with loss (vomiting/diarrhea), and with Addison's disease or kidney disease.
- **K+** - *potassium* - Increases can indicate kidney disease due to decreased excretion; it is also seen with Addison's disease, dehydration, and kidney obstruction. Decreased potassium can be seen in patients with vomiting/diarrhea.
- **Cl+** - *chloride* - Increases indicate dehydration, while decreases are found in those vomiting or having diarrhea.

### **Miscellaneous Chemistries**

- **GLU** - *glucose* - Blood sugar. Glucose is primarily increased in dogs and cats with diabetes mellitus. Mild increases can be seen in dogs with Cushing's disease. If a pet is excited/stressed during a blood draw, this can also cause an increase. Diabetes should be confirmed with a urine sample; if the urine has glucose as well, this indicates diabetes. Low glucose can be due to liver disease, pancreatic disease; low blood sugar can lead to collapse, seizures, or a coma.
- **AST** - *aspartate aminotransferase* - An enzyme found in muscle and liver cells. An elevated AST can indicate damage to the liver, heart, or skeletal muscles of dogs and cats.
- **CK** - *creatine kinase* - An enzyme within the muscles that is released into the blood when muscle is damaged. Elevations indicate muscle damage, including damage to the heart.

- **CHOL** - *cholesterol* - A form of fat. Increased cholesterol can be from a variety of metabolic diseases including diabetes mellitus, hypothyroidism, Cushing's disease, pancreatitis, and some types of kidney disease. Decreased cholesterol may be seen in those with liver insufficiency and intestinal disease.
- **TRIG** - *triglycerides* - A type of fat, the most common type in the body. Increases are seen in pets with non-fasted blood samples, or in those with pancreatitis, diabetes, Cushing's disease, or hypothyroidism.
- **Cortisol** - A hormone produced by the adrenal glands; it is normally released into the bloodstream during stress. An increase can indicate Cushing's disease (confirmed with ACTH stim test/Dexamethasone suppression test). A decrease can indicate Addison's disease (confirmed with ACTH stim test).
- **T4** - *thyroxine* - a thyroid hormone; an increased T4 can indicate hyperthyroidism (primarily in cats); a decreased T4 can indicate hypothyroidism (primarily in dogs)
- **Lactate** - Measures the amount of lactic acid in the blood. Elevated values indicate either local or general decreased blood perfusion and can potentially serve as a prognostic aid when triaging a critical patient.