

# Glossary of South Tabor Family Physicians Laboratory Tests

**This guide is meant to help provide a basic understanding of your lab results, it is not intended for use to diagnose or treat any disease or condition.**

Please use this as a supplement to your health care provider's interpretation of your lab results. Don't be concerned if your results are a little lower or a little higher than the "normal ranges," as this is common for most healthy people.

Your provider reviews your test results along with your medical history, medication use, and physical exam findings to help make a diagnosis or treatment recommendation.

Most of the information on this handout was summarized from [www.labtestsonline.org](http://www.labtestsonline.org) which is a great resource if you want to look up more information about lab tests.

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**CHEMISTRY TESTS:** These may be part of a CMP, BMP, lipid panel, renal panel, or liver panel.

**ALT and AST** (Alanine Transaminase, Aspartate Transaminase): liver enzymes which becomes elevated when the liver is damaged, such as from acute hepatitis, viral infections, cirrhosis, alcoholism, or fatty liver disease. Low levels are not concerning.

**Albumin:** a protein made by the liver. Decreased levels can be caused by many conditions including liver or kidney disease, inflammation, infection, malnutrition, chronic illness, diabetes, congestive heart failure, or hypothyroidism. Increased levels can be seen when dehydrated.

**ALP** (Alkaline Phosphatase): an enzyme found mostly in liver and bone tissues. Decreased levels may be caused by zinc or protein deficiency, or malnutrition. Elevated results can be caused by liver disease, Paget's disease, increased bone cell activity, pregnancy, or ulcerative colitis. Children normally have higher ALP levels due to bone growth, especially during growth spurts.

**Bilirubin:** is a normal waste product produced by the breakdown of hemoglobin in our red blood cells (RBCs). It is carried through your blood to the liver where it is conjugated into **direct bilirubin** which then enters the bile duct and is passed into the intestines where it is excreted. Total bilirubin can be elevated when abnormal amounts of RBCs are being destroyed in the body, or when liver disease is present. Direct bilirubin (aka conjugated bilirubin) is elevated when the liver is able to process the bilirubin normally, but it cannot exit the liver due to a blockage of the bile duct. This is common with gallstones. Gilbert syndrome is an inherited condition which causes elevated bilirubin without causing other disease. Newborns may have elevated bilirubin levels during their first few days after birth as their liver matures, but this resolves itself within a few days. Low levels of bilirubin are not generally cause for concern.

**BUN** (Blood Urea Nitrogen): a waste product formed in the liver by protein metabolism and excreted by the kidneys. Increased levels suggest kidney disease or damage, or can be caused by a high protein diet. Low levels are not concerning.

**Calcium** is a mineral which is essential for many body functions, from blood clotting, muscle and nerve function, and the formation of bones and teeth. 99% of the body's calcium is in the bones, and 1% is in the blood. If blood calcium gets low, the body takes it from the bones to help maintain the right concentration. Elevated calcium levels are concerning, as they can indicate hyperparathyroidism, or cancer, but excess Vitamin D intake, prolonged immobilization or certain diuretics can also increase blood

calcium. Decreased calcium can be caused by low albumin from liver disease or malnutrition, alcoholism, acute illness, dietary calcium or magnesium deficiency, kidney failure, pancreatitis, or low Vitamin D.

**Cholesterol:** cholesterol is necessary for many body functions, including making hormones, cell membrane formation, and bile acid formation. Total cholesterol is measured as part of a lipid panel, but cholesterol measurement is also broken down into HDL cholesterol (AKA “good cholesterol”), LDL cholesterol (AKA “bad cholesterol”), and VLDL cholesterol which is calculated. Any cholesterol which is not HDL is truly the “bad cholesterol,” which is why a calculation for non-HDL cholesterol is included in a lipid panel. When blood cholesterol levels are too high, it can form plaques on the walls of your blood vessels, narrowing and hardening them until it can lead to many types of heart disease, including heart attack or stroke.

**CO<sub>2</sub>:** AKA bicarbonate is a by-product of metabolism in the body and is one way your body maintains its acid-base equilibrium. Excess CO<sub>2</sub> is normally removed from the body via the lungs and kidneys, but any disease which affects them can cause CO<sub>2</sub> to be abnormal. Examples of conditions which can cause low CO<sub>2</sub> levels can be caused by diarrhea, kidney disease, diabetic or metabolic acidosis, Addison disease, hyperventilation, and certain drugs. High CO<sub>2</sub> can be found in COPD, severe vomiting/diarrhea, lung disease, Cushing syndrome, metabolic alkalosis, and certain other drugs.

**Creatinine:** is a normal waste product made by your body’s muscles from creatine breakdown. Your body uses creatine for muscle contractions. Your body eliminates creatinine through the kidneys and out in the urine, so any disease or condition which causes impairment of kidney function or obstruction in urine output can elevate blood creatinine levels.

**Electrolytes: sodium (Na<sup>+</sup>), potassium (K<sup>+</sup>), and chloride (Cl<sup>-</sup>)** are dissolved salts found in the body which help maintain a healthy water balance as well as a stable pH level. These are mostly obtained from dietary sources. Severe imbalance of electrolytes can be a very serious or even life-threatening condition, so it is monitored closely. Hydration status, dietary salt intake, diabetes, heart and kidney disease, and certain medications can all affect electrolyte balance. One important note is that potassium can leak from cells during and after blood collection, causing a falsely elevated result. This is why you should never pump your fist during a blood draw!

**GGT (gamma glutamyl transferase):** one of the liver enzymes which becomes elevated when there is liver disease, alcohol consumption, or problems with the bile duct. This is one part of the liver panel.

**Glucose:** is a blood sugar which is the body’s primary energy source. Your body breaks down carbohydrates into glucose during digestion, causing blood glucose levels to rise. It is then stored in your body’s cells with the help of insulin. When your body’s ability to produce insulin decreases, your blood glucose levels remain elevated, which can lead to diabetes. Chronically elevated glucose levels can have a negative effect on many organs in your body. Severely decreased glucose, or hypoglycemia, can make you feel weak and light-headed, and could cause nerve or brain damage. Glucose is commonly measured after an 8-12 hour fast since it is a more accurate baseline level of your body’s glucose level.

**Phosphorus:** this is a mineral which we gain through food. It is vital for many functions in the body, including muscle and nerve function, maintaining the acid-base balance, and energy production. It also combines with calcium to help form our bones and teeth. Blood phosphorus levels may be low when you drink too much alcohol, are malnourished, have high blood calcium levels or hyperparathyroidism, are in ketoacidosis, or use antacids frequently. Elevated phosphorus is commonly found in kidney failure or liver disease, hypoparathyroidism, or increased phosphate supplementation.

**Total Protein:** includes both albumin and globulin, the two proteins found in the blood, and made by the liver. TP levels can be decreased in severe liver disease or malnutrition, kidney disease, and congestive

heart failure. Increased levels can be found in dehydration or chronic inflammation, or bone marrow disorders.

**Triglycerides:** are a form of fat found in the blood and also present in fat tissue in the body. They are a major form of energy in the body, and blood levels go up after eating which is why they are affected by your fasting status. When they remain significantly elevated, it indicates an increased risk of developing cardiovascular disease, diabetes, or pancreatitis. Low levels are not generally concerning. Triglycerides are usually measured fasting because of the dietary effect on triglyceride levels: if you recently ate a fatty, high-carbohydrate meal, your triglycerides may temporarily be higher than usual.

**Uric Acid:** is produced by your body as it breaks down purines from normal cellular aging and death, and also from certain foods such as beer, liver, anchovies, dried beans, and peas. Uric acid is mostly eliminated from the body through the kidneys and out into the urine. If too much is produced, or if it's not removed properly, uric acid can accumulate in the body and crystallize which can cause gout, a painful condition causing inflammation in the joints. Excessive levels can also cause kidney stones to form in the urine. Low levels in the blood are generally not concerning. High levels of blood uric acid can be caused by kidney disease, use of diuretic drugs, rapid weight loss, and a diet rich in high-purine foods such as organ meats, anchovies, sardines, and alcohol. It may be temporarily elevated after strenuous exercise.

## **HEMATOLOGY TESTS:**

**ERYTHROCYTE SEDIMENTATION RATE (ESR):** this is a test which your provider might use, alongside other tests, to help identify the presence of inflammation or infection in your body. It is a non-specific marker, meaning it does not tell you what the cause of the inflammation is.

### **Complete Blood Count (CBC) or Automated Blood Count (ABC):**

These parameters all make up the ABC and are also included in a CBC.

**WBC:** The total white blood cell count, which can be used to help identify infection, inflammation, or bone marrow production of blood cells. WBCs form your body's defense system to help protect against sources of infection, allergic responses, and have a role in inflammation. The total population of WBCs in the body is broken down into 5 main cell types which each have their own unique function: neutrophils, eosinophils, basophils, monocytes, and lymphocytes. Abnormal WBC counts can rarely be a sign of a more serious condition such as leukemia or sepsis, so your provider takes into account your entire blood count results to determine the best course of action.

**LYM%:** This is the automated differential count of the lymphocyte population of the total WBC count. Lymphocytes are mainly responsible for antibody production and fighting viral infections. When the LYM% is elevated, usually the GRA% is decreased and vice versa.

**GRA%:** This is the automated differential count of the granulocyte population of the total WBC count, mainly neutrophils, which are responsible for fighting against bacterial infection.

**MID%:** This is the automated differential count of cells which are neither lymphocytes nor granulocytes, which include monocytes, eosinophils, and basophils.

**Red Blood Cell (RBC) Indices:** the following all look at the RBC population in your blood and all together they give your provider information about your blood cells.

**RBC:** This is the total RBC count in your blood. When this is low, you are considered anemic. It may be elevated if you are dehydrated or have a condition such as polycythemia or

hemochromatosis which are inherited disorders that cause too much RBC production. Smoking can also cause increased RBC counts as your body tries to compensate for lack of oxygen.

**HGB:** Hemoglobin is a protein containing iron which is present in all RBCs, which allows them to carry oxygen throughout the body. Hemoglobin levels can be low when you are anemic, and can make you feel weak, tired, and fatigued. This can be due to kidney disease, iron or vitamin B12 / folic acid deficiency, a hemoglobin disorder such as thalassemia or hemoglobinopathy (such as sickle cell disease.) When hemoglobin levels are high, it can be due to dehydration, smoking, lung or heart disease, polycythemia, or hemochromatosis.

**HCT:** The hematocrit percentage is also known as the packed cell volume and is the percentage of your total blood volume which is RBCs. It can be decreased with causes of anemia and increased with dehydration, lung or heart disease, polycythemia, or hemochromatosis.

**MCV:** Mean corpuscular volume refers to the size of the individual red blood cells. When this is low, the cells are considered microcytic (small cell size) and it can indicate iron deficiency or a hemoglobinopathy such as thalassemia or sickle cell disease. When elevated, cells are macrocytic (large cell size) and it can be from vitamin B12 or folic acid deficiency, excess alcohol consumption, liver disease, and hypothyroidism.

**MCH and MCHC:** Mean corpuscular hemoglobin concentration is similar to MCV, except it measures the average hemoglobin in each red blood cell.

**RDW:** the RBC distribution width refers to how much variance in RBC size there is in your blood. When some RBCs are normal size, but many are also either small or large, the RDW will be elevated. A low RDW means most of your RBCs are uniform in size.

**PLT:** Platelets or thrombocytes are tiny cell fragments in your blood responsible for normal blood clotting. When you have an injury, platelets help stop bleeding by clumping together and activating clotting factors in the blood. Low platelet counts can be from viral infections, certain medication use, long-term bleeding, bone marrow disorders, liver cirrhosis, autoimmune disorders, and certain conditions which cause increased platelet consumption in the body. Your platelet count can also be slightly low from improper specimen collection and handling during phlebotomy, causing re-collection to be required. Increased platelet counts can be caused by anemia, inflammatory diseases, recovery from a recent large blood loss, birth control pill use, or even physical activity. Abnormal platelet counts can sometimes be a sign of a more serious disorder such as leukemia, clotting disorder, or genetic mutation, so your provider will consider all your lab results together to determine the best course of action.

**MPV:** Mean platelet volume refers to the size of your platelets. Sometimes, platelets can be larger than normal and although this is not necessarily a concerning finding, large or giant platelets can sometimes confuse the CBC analyzer into being counted as white blood cells, so the MPV can help to differentiate those cases.

**SEG%, BAND%, LYMP%, MONO%, EOSIN%, BASO%, (META%, MYELO%, BLAST%):** These all make up the manual differential count, (M-Diff) which is performed when the WBC count is >12,000 or your provider is concerned about infection. We look at a stained smear of your blood under the microscope and count 100 white blood cells, differentiating between these types of cells using a special counter. Out of the 100 cells, we are able to report out a percentage of the different WBC populations. Your provider uses this M-Diff to help identify the cause of an abnormal WBC count. Not all of these cell types are reported with every M-Diff, if they are not observed during the 100-cell count. For example, META, MYELO, and BLAST which are all in listed in parenthesis above are immature WBCs which are not often seen in the blood unless a more serious condition is present.

**RBC and Platelet Morphology:** polychromasia, hypochromia, poikilocytosis, target cells, spherocytes, anisocytosis, microcytosis, macrocytosis, basophilic stippling, vacuoles, toxic granulation, platelet estimate, and platelet morphology. These all represent microscopic findings which the laboratory technician may see while looking at a stained blood smear, which your provider looks at alongside the automated CBC results to determine the cause of any abnormality in your blood count.

## **IMMUNOASSAY TESTS:**

**TSH:** Thyroid-Stimulating Hormone is produced by your pituitary gland which tells your thyroid gland to produce the thyroid hormones T4 and T3. If your thyroid gland is not making enough, your TSH level goes up to attempt to stimulate more T4/T3 production. Conversely, if you are making too much T3/T4, your TSH should decrease. High TSH levels can be caused by hypothyroidism, Hashimoto's thyroiditis, thyroid medication dosing issues, and pituitary gland issues. Low TSH levels can be caused by hyperthyroidism, Graves' disease, thyroid medication dosing issues, and pituitary gland issues. Your provider will look at your complete medical history, medications, and all thyroid hormone results to determine the best course of action for any abnormal TSH level.

**FT4 and FT3:** Thyroxine (T4) and triiodothyronine (T3) are the two major hormones produced by your thyroid gland. Most T3 and T4 in the body is bound to protein, but the unbound hormones are the biologically available forms. These are known as the free T3 and free T4. A high FT4 or FT3 level can be caused by hyperthyroidism or indicate an issue with the pituitary gland or TSH receptors on the thyroid gland. Decreased T3 or T4 can be caused by hypothyroidism of the thyroid gland or pituitary gland. Your provider takes into account all your thyroid test results together with your medical history before making a diagnosis or change in thyroid medication.

**TPSA and FPSA:** Prostate-Specific Antigen is a protein produced by cells in a man's prostate. Measuring the total PSA (TPSA) level is a good tool to screen for and monitor prostate cancer, but it is not perfect because other conditions can cause elevated TPSA levels also. These include prostatitis, an infection in the prostate gland, and benign prostatic hyperplasia (BPH) which is a non-cancerous enlargement of the prostate which can be common in men middle-aged and older. Recent bicycle riding, digital rectal exam, or even ejaculation can temporarily "falsely" elevate a PSA level. To help differentiate between men with an elevated TPSA who are at risk for cancer from a temporary elevation, a free PSA (FPSA) level can also be measured. When the amount of FPSA is relatively low to the TPSA, the likelihood of prostate cancer is higher. (Lower %FPSA = higher risk of prostate cancer.) Ultimately, your provider combines your PSA results with the findings of a digital rectal exam of the prostate done during your physical to determine if further diagnostic work-up is required, or if a slightly elevated PSA simply needs to be monitored for now.

**Ferritin:** Your body stores iron in a protein called ferritin. When you are anemic (low RBC or hemoglobin level) your provider may order a ferritin level to determine if your body is storing iron properly. Or, if you have hemochromatosis or polycythemia, your provider may monitor your ferritin level to make sure you aren't getting overloaded with iron. Decreased blood ferritin levels may be from insufficient dietary iron, improper iron absorption, pregnancy, or chronic blood loss. Increased ferritin is seen in hemochromatosis, people with thalassemia or hemoglobinopathies who have repeated blood transfusions, alcoholism and chronic liver disease.

**hCG-β:** Beta human chorionic gonadotropin is a hormone which is produced by the placenta during pregnancy, increasing steadily during the first trimester, approximately doubling every 48-72 hours. Serum hCG is most commonly used to confirm early pregnancy when it's too early for a urine pregnancy

test to turn positive. However, it can also be used to confirm a miscarriage by monitoring sequential levels of hCG as they decrease and eventually reach zero, or if the level is much lower than expected for the gestational age of the fetus.

## **URINE TESTS**

**URINALYSIS:** A urinalysis, or UA test gives your provider a lot of information about your urinary tract health from your kidneys to the bladder, including infections, kidney stones, kidney disease and damage, or elevated proteins. Both a chemical (dipstick) and microscopic examination make up a UA.

**MICROALBUMIN:** called a “micral” for short, this test looks at the amount of albumin protein in your urine compared to the amount of creatinine. When the A/C ratio is high, your kidneys are spilling too much protein into your urine which can indicate kidney disease or damage.

**Urine Drug Screening:** If you are prescribed a medication which is a controlled substance, such as a narcotic pain medication, or meds for ADD/ADHD, anxiety, or insomnia, your provider may require periodic urine drug screening (UDS) to help ensure your safety and compliance in treatment. This doesn't necessarily mean that your provider suspects you of doing anything wrong or using illegal drugs, it's just part of universal, best practices for prescribing these types of medications. It can also help your provider to have important conversations with you about potentially dangerous drug interactions, including medical or recreational marijuana use while taking controlled medications. When you have a UDS test, we ask all patients to make a list of all medications you've recently taken, since certain meds can give you a “false positive” result on a drug screening, and we take these into consideration when interpreting the test results. Be sure to include all over-the-counter medications as well as any vitamins or herbal supplements (including marijuana or CBD oil) on this list.

## **OTHER TESTS**

**CARDIAC PROFILE:** your provider may order a cardiac profile if you're experiencing chest pain, if they suspect you've had a heart attack, or to monitor chronic heart conditions such as congestive heart failure or chronic obstructive pulmonary disease. Our cardiac profile includes 3 tests: CK-MB, troponin I, and BNP.

**CK-MB:** Creatine kinase is an enzyme which is released into the blood when there is muscle damage. The MB isoenzyme of CK is specific to heart muscle, so this can help your provider determine if you've had a heart attack. However, any kind of heart damage can cause elevated CK-MB including physical trauma, kidney disease, decreased oxygen, or even strenuous exercise. CK-MB begins to rise as soon as 3 hours after a cardiac injury and then it returns to normal within 2-3 days.

**Troponin I:** TNI is a protein found in heart muscle which is released into the blood when there is damage to the muscle. It begins to rise as soon as 3 hours after a cardiac injury and remains elevated for several days before returning to normal. It can also be elevated with heart conditions such as congestive heart failure or myocarditis, or with other conditions such as kidney disease or pulmonary embolism (blood clot in the lung.)

**BNP:** Brain natriuretic peptide, or B-type natriuretic peptide is normally produced by the heart, but levels increase when the heart is working too hard to pump blood through your body. It is used to diagnose and monitor heart failure. The higher the number, the harder your heart is struggling to pump blood.

**D-DIMER:** D-dimer or DD is usually ordered when your provider suspects you may have a blood clot, either a deep vein thrombosis (DVT) which commonly presents in your leg, or a pulmonary embolism (PE) which is a blood clot in your lungs. DD is produced when a clot or clots form in your body and your body tries to dissolve it. When the DD level is elevated, it doesn't necessarily mean that you currently have a clot, but your provider may send you to have diagnostic imaging such as an ultrasound or CT scan to help visualize if one is present and how large it is.

**HGB A1C:** This test helps your provider estimate how high your blood sugar (glucose) has been over the last 3 months. The higher your blood glucose level is, the more glucose attaches to the hemoglobin in your blood cells, becoming glycated hemoglobin or hemoglobin A1c. Since red blood cells (RBCs) only live about 3 months, the glycated hemoglobin is cleared from the blood as the cells die. Therefore, the more glycated hemoglobin is present, the higher your blood glucose levels have been. An A1c can be used to screen for, diagnose, and monitor diabetes and pre-diabetes. The A1c result can also be used to calculate a person's estimated average glucose level, and the EAG calculation is reported along with the A1c on our lab reports. On a side note, for patients with certain blood disorders or hemoglobinopathies such as sickle cell disease, hemoglobin C or E, or thalassemias, the HGB A1c test may not be the best method to monitor glucose control, and a different test may be selected by your provider instead.

**RAPID TESTS:** *These tests are often done during an office visit while you wait to help your provider diagnose a condition which requires immediate treatment.*

**Saline Wet Mount:** This is a microscopic examination of a sample of vaginal discharge or prostatic fluid to help your provider diagnose and treat infections appropriately.

**KOH Prep:** This is a microscopic examination of skin cells obtained by scraping to help identify fungal infections. Potassium hydroxide (KOH) dissolves skin, leaving only fungal cells behind.

**Rapid Strep:** This test is done with a swab of your throat and is the fastest way to detect if *Streptococcus pyogenes* (the bacteria which causes strep throat) is present. Rarely, this test can be negative when strep throat is actually there so your provider may ask for a throat culture to confirm if no infection is present. However, the throat culture can take up to 2 days to get results.

**Influenza A/B:** This test is done with a swab of your nasal passages to detect whether you may have the flu virus, and also differentiates between type A and type B Influenza.

**Mono Test:** This is a blood test used to detect heterophile antibodies for Epstein-Barr virus, which causes the disease mononucleosis.

**H. Pylori:** This blood test is used to detect antibodies to a type of bacteria called *Helicobacter pylori*, which is a common cause of stomach ulcers and other gastrointestinal illnesses. However, it does not differentiate between current and past infections with *H. pylori* so you can test positive if you've ever had it in the past, in which case a stool specimen or a breath test is used to test for the *H. pylori* bacteria.

**HIV 1+2:** This blood test is used to detect antibodies to HIV-1 and HIV-2, although it does not differentiate between the two types. It is a routine screening test for HIV infection.

**Urine hCG:** This urine test can detect human chorionic gonadotropin, AKA the pregnancy hormone. It is used to test for pregnancy, and also prior to implantation of long-acting birth control devices such as an IUD or Nexplanon to confirm that you're not pregnant. Very early pregnancy may not produce high enough levels of hCG for a urine test to be positive, so your provider may also order a blood hCG level if your urine hCG is negative but they suspect you may be pregnant.