

Understanding Lab Tests I: Complete Blood Count and Blood Chemistry ^[1]

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Lab Tests Are Important Tools

Having regular lab tests (blood and sometimes urine tests) is a necessary part of caring for your health. If you are living with HIV (HIV+), lab tests are especially important tools that help you and your health care provider keep track of how you are doing in the following areas:

Immune system status

- How HIV is affecting your [immune system](#) ^[2]
- If you need to start or change HIV drugs
- Example of lab test: CD4 cell count test (see The Well Project's article on [Understanding CD4 Cells and CD4 Cell Tests](#) ^[3])

HIV illness

- How HIV is responding to the drugs you are taking
- Which drugs to use
- The specific characteristics of your virus
- Examples of lab tests: [viral load](#) ^[4] test, [resistance](#) ^[5] test, tropism test (see The Well Project's article on [Understanding Lab Tests II](#) ^[6])

Overall health

- How your body's organ systems are functioning
- If you have [side effects](#) ^[7] from the drugs
- If you are having problems that are not related to HIV

- Examples of lab tests: complete blood count, blood chemistry (explained below)

The Basics

When you are first diagnosed as HIV+ and when you first start taking HIV drugs, you should get "baseline" blood tests that give a picture of your health at that moment. Later tests can be compared against these results to see how things are going, and if they are changing. Most lab tests should be done every three to six months, or as often as your health care provider recommends.

Because different labs use different equipment, test results from different labs can vary. Therefore, it is a good idea to have your tests done at the same lab each time. If you get an unexpected result on one test, your health care provider will probably want you to get a second test to see if the results are the same as the first one. Try not to worry too much about a single unexpected result?usually trends over time are more important.

Most lab reports show the normal range of results from each test and highlight any of your results that are outside the normal range. The ranges listed below are general and may not be exactly the same as your lab. Look at your lab report for the normal ranges they use.

Complete Blood Count (CBC)

Blood is made up of different types of cells including red blood cells, white blood cells, and platelets. The complete blood count (CBC) is a test that measures the amount of these cells in a sample of your blood. CBCs are especially important for HIV+ people because some HIV drugs and infections can cause changes in your red or white blood cell counts.

- **Red blood cells (erythrocytes)**

Red blood cells (RBCs) carry oxygen throughout the body. A typical RBC count for women is four to five million red blood cells. Hematocrit (HCT) measures how much of your blood is made up of RBCs, and hemoglobin (HGB) tests measure the amount of hemoglobin in your blood. Hemoglobin is the protein in RBCs that allows them to carry oxygen. A normal HCT for women is 36 to 44 percent and a normal HGB level is 12 to 15. A low RBC count, HCT, or HGB may mean you have anemia, which can cause you to feel tired. For more information, see The Well Project's article on [Anemia and Women](#) [8].

- **White blood cells (leukocytes)**

White blood cells (WBCs) are produced by the immune system and help defend the body against infection. A normal total WBC count is 4,500 to 10,000 (or 4.5 to 10.0). A high count may mean that your body is fighting an infection. Low counts may be caused by certain drugs or infections. There are different types of white blood cells that are listed on your lab report as "the differential." The differential tells you the amount of each type of white blood cell as a percentage of the total WBC count.

- **Neutrophils**

These cells fight bacterial infections. A normal neutrophil percentage is about 50 to 70 percent of the total WBC count. When your neutrophil count is low (a condition called neutropenia), you are more likely to get bacterial infections.

- **Lymphocytes**

There are two types of lymphocytes: B cells and T cells. B cells make antibodies

and T cells attack germs. Usually, lymphocytes account for about 20 to 40 percent of the total number of WBCs. CD4 cells are a type of T cell that is measured separately. For more information, see The Well Project's article on [Understanding CD4 Cells and CD4 Cell Tests](#) [3].

- **Monocytes and Macrophages**

These cells engulf or "eat" and destroy disease-causing organisms (germs). They normally make up about two to ten percent of the total WBC count.

- **Eosinophils and Basophils**

These cells play a role in allergic reactions and defend against parasites. They normally make up about one to eight percent of the total WBC count.

- **Platelets (thrombocytes)**

Platelets are necessary for blood clotting. A normal platelet count is about 130,000 to 440,000. If your platelet count is low, you may bleed or bruise easily.

Blood Chemistry

Blood chemistry tests measure certain chemicals in your blood. Results of these tests give your health care provider important information about your general health status, how well organs like the liver and kidneys are working, and whether you may be experiencing drug side effects. Abnormal results can indicate a problem that needs to be addressed. Important blood chemistry tests include:

- **Liver function**

These tests help measure how well your liver is working. Some of the tests measure liver enzymes such as alanine transaminase (ALT), aspartate transaminase (AST), and alkaline phosphatase (ALP). High levels of liver enzymes may be a sign of liver damage. Several HIV drugs can cause elevated liver enzymes. Liver function tests also measure bilirubin, which comes from the breakdown of hemoglobin from RBCs. High levels of bilirubin may indicate liver problems. Taking the HIV drug Reyataz (atazanavir) can increase bilirubin levels; however, this rise in bilirubin is harmless.

- **Kidney function**

These tests help measure how well your kidneys are working. They include blood urea nitrogen (BUN), creatinine, and eGFR, which is a measure of how well your kidney is filtering different chemicals in the blood. Kidney tests are especially important if you are taking Viread (tenofovir) and Stribild (four HIV drugs combined into one). For more information on any of these HIV drugs, see our [HIV Drug Chart](#) [9] article.

- **Electrolytes**

Electrolytes play important roles in the healthy functioning of cells, nerves, and organs. Bicarbonate (CO₂), chloride, potassium, and sodium are electrolytes. Electrolyte imbalances may be caused by not getting enough nutrients (malnutrition) or water (dehydration), or by kidney problems.

- **Blood sugar (glucose)**

Your body uses glucose for energy. High glucose levels (hyperglycemia) can be a sign of diabetes or insulin resistance (when the body does not respond to insulin, a hormone to help control glucose levels). High glucose levels can be a side effect of HIV drugs. Your health care provider can monitor your levels through glucose tests. For the most accurate results, it is best to check glucose levels when you have been fasting (not eating or drinking anything but water for about eight hours). For more information, see The Well Project's article on [Diabetes](#) [10].

- **Blood fat (lipids)**

Many HIV+ people have an increased amount of fat, or lipids, in their blood such as cholesterol and triglycerides. Higher cholesterol levels can increase the risk of a heart attack or stroke. Higher triglycerides can increase the risk of damage to the pancreas (pancreatitis). Your lab report will list the amount of the following lipids in your blood (for the most accurate results, it is best to check lipid levels when you have been fasting):

- **Total cholesterol**
Cholesterol is a fatty substance that circulates in the blood. It is best to keep your total cholesterol level below 200.
- **Low-density lipoproteins (LDL)**
This is "bad" cholesterol, which can clog the arteries. It is best to keep your LDL level below 100 to 130.
- **High-density lipoproteins (HDL)**
This is "good" cholesterol, which helps reduce the risk of heart disease. It is best to get your HDL level up to at least 40.
- **Triglycerides**
After eating, energy that is not needed right away is converted into a substance called triglycerides, which is stored in fat cells. It is best to keep your triglyceride level below 100 to 150.

HIV disease and HIV drugs can both cause increased lipids (hyperlipidemia). Staying [physically active](#) [11], [eating well](#) [12], and certain medications can help to lower high lipid levels. For more information, see The Well Project's articles on [Hyperlipidemia](#) [13] and [Lipodystrophy and Body Shape Changes](#) [14].

- **Blood proteins**

These tests provide information on nutrition problems and help diagnose kidney disease, liver disease, and many other conditions. Tests include albumin and total protein.

- **Calcium**

Calcium, one of the most important minerals in your body, is a major part of bones and teeth. Blood calcium is tested to check for a range of conditions relating to the bones, heart, nerves, kidneys, and teeth. It is important to remember that you can still have weak bones (osteoporosis), even if your calcium blood test is normal. For more information, see The Well Project's article on [Bone Health](#) [15].

Labs routinely group certain chemistry tests together and call them panels or profiles. Some common panels or profiles you may see listed on your lab report are:

- Basic metabolic panel: Includes calcium, electrolytes, kidney function, and glucose
- Comprehensive metabolic panel: Includes same tests as basic panel plus blood proteins and liver function
- Lipid panel: Includes cholesterol, LDL, HDL, and triglycerides

The Bottom Line

Since many HIV+ people have no noticeable symptoms of health problems, it is important to get regular lab tests to monitor how you are doing. Abnormal blood tests can be a sign of serious health problems and need to be addressed as soon as possible so that you can remain healthy and strong.

Whether you are taking HIV drugs or not, all the tests listed above are a key part of your medical care. Regular monitoring is an important way to take charge of your health.

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Additional Resources

Select the links below for additional material related to lab tests.

[Complete Blood Count \(Lab Tests Online, from AACC: American Association for Clinical Chemistry\)](#) [33]

[The Blood Tests You'll Need \(AIDSmeds\)](#) [34]

[Complete Blood Count \(The AIDS InfoNet\)](#) [35]

[Complete Blood Count \(Mayo Clinic\)](#) [36]

[Basic metabolic panel \(Medline Plus/NIH\)](#) [37]

[Comprehensive metabolic panel \(Medline Plus/NIH\)](#) [38]

[Understanding Lab Tests \(USVA\)](#) [39]

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