



## *Reading a Lab Report: A Basic Primer*

Written by: Alan Franciscus, Editor-in-Chief

### *Foreword*

Monitoring hepatitis C (HCV) treatment and managing HCV disease is a complex process that includes using blood tests. These include a complete blood count (CBC), chemistry panel, and liver function tests. This fact sheet is intended to help you understand these kinds of blood tests, and is not intended as medical advice. All people with HCV should consult a medical provider for diagnosis and treatment of HCV.

It is important to remember that lab results can vary between labs so the same lab should be used whenever possible. Information gained from blood work over time and repeated tests shows a trend or pattern. In general, medical decisions should not be made on just one test result.

### **Three types of lab tests are used to monitor general health and liver health:**

- 1. Liver biochemical/function tests** measure various enzymes released by the liver into blood, and other liver functions. Liver enzymes may be elevated when damage occurs in the liver.
- 2. Complete blood counts (CBC)** measure the three components of blood: red cells, white cells, and platelets.
- 3. Chemistry panels** measure minerals (electrolytes), sugar (glucose) and fats (lipids) in the blood, as well as liver and kidney functions.

Lab reports provide reference range information, often on the right side of the report. For each function measured, these ranges will tell you what is “normal” for that function. Many lab reports also contain a column which lists out-of-range values, making it easy to see problems quickly. It should be noted that an out-of-range function is only an indication of a potential problem that warrants further investigation.

The section below provides more detailed information on the different types of lab tests, including a brief discussion on what out-of-range values could mean.

### **HCSP FACT SHEET**

*A publication of the  
Hepatitis C Support Project*

#### **EXECUTIVE DIRECTOR, EDITOR-IN-CHIEF, HCSP PUBLICATIONS**

*Alan Franciscus*

#### **DESIGN**

*Leslie Hoex,  
Blue Kangaroo Design*

#### **PRODUCTION**

*C.D. Mazoff, PhD*

### **CONTACT INFORMATION**

Hepatitis C Support Project  
PO Box 15144  
Sacramento, CA 95813  
alanfranciscus@hcvadvocate.org

The information in this fact sheet is designed to help you understand and manage HCV and is not intended as medical advice. All persons with HCV should consult a medical practitioner for diagnosis and treatment of HCV.

This information is provided by the Hepatitis C Support Project a nonprofit organization for HCV education, support and advocacy

Reprint permission is granted and encouraged with credit to the Hepatitis C Support Project.

## Reading a Lab Report: A Basic Primer

### 1. Liver Biochemical/Function Tests

**Alanine aminotransferase (ALT)**, previously called SGPT, is an enzyme produced in the liver cells (hepatocytes). The level of ALT in the blood increases when liver cells are damaged or die at higher than normal rates. Drugs, alcohol use, toxins, viruses, and other substances cause liver cell damage that can lead to elevations in ALT levels. Liver cell death also causes increased ALT levels. The level of ALT may correlate roughly with the amount of cell death or inflammation (the immune system's response to irritation or injury) in the liver, but this is not always the case. For instance, some people with advanced HCV have relatively normal ALT levels.

ALT levels are used to gauge inflammation and damage to the liver at any one point in time. Normal ALT levels, like 'normal' values for every lab test, vary—some from lab to lab—but are commonly reported as 0-40 IU/L. Looking for a trend or pattern over time is more important than any single value. For instance, a repeated measure of 100 may be 'normal' for someone who consistently tests within this range. However, a measurement of 225 for this person would indicate that there may be increased inflammation or cell death that would warrant further evaluation.

Approximately 30% of people with HCV have 'normal' ALTs. Most people with persistently normal ALT levels have mild or no fibrosis and their rates of HCV disease progression are slower compared to patients with high ALTs. However, this is not always the case since about 20% of people with 'normal' ALT levels have on-going liver disease progression that could lead to cirrhosis and other complications. There are also differences in what is considered a normal value in males vs. females and in some other populations. For this reason it is recommended that a liver biopsy, Fibroscan, or other non-invasive liver tests should be performed to accurately stage and grade the amount (if any) of liver disease rather than relying on ALT levels.

**Aspartate aminotransferase (AST)**, previously called SGOT, is an enzyme similar to ALT but is less specific for liver disease. In many cases of liver inflammation, the ALT and AST levels are elevated. Normal ranges from 3-44 IU/L.

**Alkaline phosphatase** is an enzyme produced in the bile ducts and the bone, kidneys, intestine and the liver. Levels are increased in hepatitis, cirrhosis, and other illnesses. Some medications may also cause increased levels. Normal ranges from 30-125 IU/L (adults).

**Gamma-glutamyl transpeptidase (GGT or GGPT)** is also an enzyme produced in the bile ducts which may be elevated in people with bile duct diseases. Hepatitis and heavy alcohol consumption also increase GGT. Normal ranges from 18-85 IU/L (male); 18-61 IU/L (female).

**Bilirubin** is the major breakdown product of old red blood cells. Hemoglobin is released from the red blood cells; the "heme" portion is further broken down into bilirubin. When liver function is impaired, as with acute hepatitis or end stage liver disease, bilirubin accumulates in the blood and causes yellowing of the skin and eyes, called jaundice. In chronic HCV, bilirubin levels are usually normal until a significant amount of liver damage has occurred. Bilirubin is often reported as total, indirect (the amount of "unconjugated" bilirubin), and direct (the amount of "conjugated" bilirubin which is then excreted from liver cells). Normal range of total bilirubin is 0.2 – 1.3 mg/dL (adults).

**Albumin** is a protein that is synthesized by the liver and circulates in the blood and is responsible for maintaining normal blood volume. Low albumin levels indicate poor liver function and contribute to peripheral edema (accumulation of fluid in the feet and ankles) and ascites (accumulation of fluid in the abdominal area) sometimes seen in very late stage liver disease. Albumin levels are usually normal in chronic liver disease until significant liver damage is present. Normal ranges from 3.5-5.0 g/dL (adult).

***Reading a Lab Report: A Basic Primer***

**Prothrombin time (PT)** is a blood clotting test and it is prolonged (or elevated) when the blood concentrations of some of the blood clotting factors made by the liver are low. In chronic liver disease, the PT is usually not elevated until cirrhosis is present and liver damage is fairly significant. Normal ranges from 9.5-13.2 seconds.

**2. Complete Blood Count (CBC)**

**White cell (leukocyte) count** provides information on the body's ability to fight infection. A high total white count means the body is actively fighting an infection; a low total white count means the body's ability to fight infection is impaired. Low white blood count may be caused by advanced HCV disease or from HCV medications. In addition to total count, a CBC gives the breakdown of each type of white cell. The types are neutrophils, lymphocytes, monocytes, eosinophils, and basophils. Neutrophil count is used to determine when a person's ability to fight common infections is impaired. Low neutrophil count is called neutropenia. Interferon can also cause neutropenia. Normal white cell count ranges from 4.0-10.0 th/uL.

**Red cell count** provides information on the body's ability to carry oxygen to cells, as well as the size of the red blood cells. The most important values are hemoglobin and hematocrit (together referred to as H&H), which measure the ability to provide the body with oxygen. Low H&H is known as anemia, a serious condition which produces fatigue. Advanced liver disease can produce anemia. Ribavirin can also cause a form of anemia called hemolytic anemia. Normal hemoglobin ranges from 13.5-17.5 (male); 12.0-16.0 (female); normal hematocrit ranges from 42-54 (male); 37-47 (female).

**Platelet count** provides information on the blood's ability to clot. Low platelet count is called thrombocytopenia and can be dangerous because of

the risk of internal and external bleeding. Advanced liver disease can cause thrombocytopenia. Normal platelet count ranges from 150-399 ( $\times 10^3/\text{mm}^3$ ).

**3. Chemistry Panel**

**Electrolytes** are minerals which are essential to life. Blood tests usually monitor the following electrolytes: sodium, potassium, chloride, calcium, iron, phosphorus, and sometimes magnesium. Chronic diseases may cause electrolyte abnormalities. If untreated, electrolyte imbalances may be life threatening.

**Glucose** is the measurement of blood sugar. High blood sugar is called hyperglycemia, and may be an indication of diabetes. Low blood sugar is called hypoglycemia and is uncommon. Normal glucose ranges from 60-109 mg/dL (fasting); 60-200 mg/dL (non-fasting).

**Lipids** are fats. The most commonly measured lipids are triglycerides and cholesterol. High triglycerides and cholesterol can be an indication of damaged arteries and potential heart disease, which are serious medical problems.

- **Cholesterol** is an essential requirement for cell health. It is a component for the manufacture of certain hormones, bile acids and vitamin D. The majority of cholesterol is produced in the liver. Animal fats also contain significant amounts of cholesterol. The two main types of cholesterol are **low-density lipoproteins** (LDL) also known as the 'bad' cholesterol, and **high-density lipoproteins** which is known as the 'good' cholesterol. It is recommended that cholesterol levels should be below 200 MG/dL. The recommended LDL levels should be less than 130 MG/dL and the HDL levels above 59 MG/dL are considered a negative risk factor for heart disease.
- Triglycerides are fats found in vegetable oils and animal fats. High levels of triglycerides are associated with heart disease. The American

***Reading a Lab Report: A Basic Primer***

Heart Association guidelines include normal range <150 mg/dL; slightly elevated 151-199 mg/dL and very high levels that correlated with a high risk of heart disease.

most common measurement of kidney function. Normal creatinine ranges from 0.75-1.20 (male); 0.65-1.00 (female).

**Kidney functions** measured by lab tests include blood urea nitrogen (BUN), creatinine, and uric acid. The kidneys are essential in eliminating body wastes and regulating blood pressure, hence a disturbance in kidney function can be a life-threatening problem. Chronic diseases including HCV can cause kidney damage. Creatinine is the

**What's the Bottom Line?**

Get copies of your blood work tests, become familiar with the results, and always consult with a health care provider before drawing conclusions or making healthcare decisions. This is another piece of staying in charge of your health.

**Note:** Ranges for laboratory tests – [www.rush.edu](http://www.rush.edu)

***Related publications:***

- **An Overview of HCV Diagnostic Tests**  
[www.hcvadvocate.org/hepatitis/factsheets\\_pdf/diagnostic.pdf](http://www.hcvadvocate.org/hepatitis/factsheets_pdf/diagnostic.pdf)
- **HCV Genotype, Subtype and Quasispecies**  
[www.hcvadvocate.org/hepatitis/factsheets\\_pdf/genotype.pdf](http://www.hcvadvocate.org/hepatitis/factsheets_pdf/genotype.pdf)
- **Non-Invasive Markers of Liver Fibrosis**  
[www.hcvadvocate.org/hepatitis/factsheets\\_pdf/non-invasive\\_markers.pdf](http://www.hcvadvocate.org/hepatitis/factsheets_pdf/non-invasive_markers.pdf)

***For more information***

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• <b>Centers for Disease Control and Prevention</b><br/><a href="http://www.cdc.gov/Hepatitis">www.cdc.gov/Hepatitis</a></li> <li>• <b>Mayo Clinic:</b><br/><a href="http://www.mayoclinic.com/health/liver-biopsy/MY00949">www.mayoclinic.com/health/liver-biopsy/MY00949</a></li> </ul> | <ul style="list-style-type: none"> <li>• <b>MedlinePlus:</b><br/><a href="http://www.nlm.nih.gov/medlineplus/ency/article/003895.htm">www.nlm.nih.gov/medlineplus/ency/article/003895.htm</a></li> <li>• <b>National Digestive Diseases Information Clearinghouse (NDDIC)</b><br/><a href="http://digestive.niddk.nih.gov/ddiseases/pubs/liverbiopsy/">http://digestive.niddk.nih.gov/ddiseases/pubs/liverbiopsy/</a></li> </ul> |
|--|--|

***Visit our websites to learn more about viral hepatitis:***

**[www.hcvadvocate.org](http://www.hcvadvocate.org) • [www.hbvadvocate.org](http://www.hbvadvocate.org)  
[www.hepatitistattoos.org](http://www.hepatitistattoos.org)**

