

## **The Hepatic Function Panel -**

From one blood draw, a lab assesses your total protein level, two classes of proteins, albumin and globulin, bilirubin and the level of liver enzymes found in the blood - ALT, ALP, AST and GGT.

Your liver contains a pint of blood 13% of your total blood supply. It filters more than a liter every minute which is about 22 gallons per hour and more than 250 gallons of blood every 24 hours. It does more than 500 different functions. It is the only organ that can regenerate itself up to 50%

**Total Protein Level - *missing page with the details***  
**6.3 to 5.0 grams per deciliter (g/dL) - source Mayo Clinic**

### **Albumin**

Using amino acids derived from dietary protein, the liver produces about 9 to 12 grams of albumin a day. Albumin in the blood makes up about 60% of the total protein level and is responsible for keeping the fluid portion of the blood contained within blood vessels. It binds with hormones, nutrients, as well as drugs allowing them to travel through the body via the bloodstream.

### **Reference Ranges for Albumin**

Albumin (g/dL)

> 5.0	High
3.7 to 5.0	Normal
< 3.7.	Low

Target Range: 4.0 to 4.5 g/dl.

High albumin levels, called hyperalbuminemia are almost always related to dehydration.

### **Supplements to support high albumin**

Milk Thistle extract ( standardized to 80% silymarins ) BID (2x a day) and NAC N-acetyl cysteine BID (2x a day)

Low albumin levels called hypoalbuminemia are more common and can arise when the body is fighting infection. Chemotherapy treatments can lower albumin. Leukemia Lymphoma Dysbiosis.

### **Supplements to support low albumen:**

Whey protein, chlorella, L-Glutamine - if you have kidney damage be cautious about too much protein.

### **Globulin**

Together with albumin globulin forms the total protein level on a blood test tab report. It is categorized into 3 main groups: alpha, beta, and gamma. Alpha and beta primarily transport proteins. Gamma are comprised of immunoglobulins (Igs) known as anti-bodies. Gamma globulins account for a majority of the globulin level.

### **Reference Ranges for Globulin**

Globulin (g/dL)

> 3.5.	High
2.0 to 3.5.	Normal
< 2.0.	Low

Target Range 2.8 to 3.2 g/dL

High Globulin - can be caused by infection, allergic reaction, auto-immune disease, inflammatory bowel disease, leukemia and liver disease. If its elevated it most likely is an infection or allergy - rule this out first.

**Supplemental support elevated globulin:**

Gut health and probiotics. High fiber low glycemic diet. If the cause is auto-immune or chronic inflammation consider Fish Oils and Turmeric ( Curcumin )

**Low globulin**

Reshi Mushroom, probiotics, NAC, Whey protein

**Albumin / Globulin (A/G) Ratio**

Typically your body will have a little more albumin than globulin, yielding an A/G ratio just over 1.0.

**Reference Ranges for Albumin / Globulin**

A/G Ratio. 1.1 - 2.4 normal

High globulin may point to a type of cancer such as myeloma or an autoimmune such a lupus. Albumin levels are low due to liver problems such as cirrhosis.

**Bilirubin**

When red blood cells are broken down by the spleen, the normal by-product is a natural orange-yellow pigment called bilirubin. Before it reaches the liver, it is called indirect or unconjugated bilirubin. Once it reaches the liver it becomes direct or conjugated bilirubin. It is stored in the gallbladder and excreted in the stool ( it gives the stool its dark brown color )

**Reference ranges for Bilirubin**

Bilirubin Type	Normal range (mg/dl)
Total Bilirubin	0.2 to 1.4
Direct Bilirubin	0.0 to 0.4

High Bilirubin often indicates liver infection or failure, gallbladder infection, biliary stricture, gallstone blockage, pancreatitis, hepatitis, mononucleosis

Elevated direct bilirubin can suggest gallbladder dysfunction or cancer.

Elevated indirect bilirubin may be the result of cirrhosis or viral hepatitis.

**Supplements to support high bilirubin:**

Milk Thistle extract, Alpha Lipoic acid, NAC, Sulforaphane - broccoli extract, schizandra, turmeric, AHCC

**Alanine Aminotransferase (ALT)**

Is an enzyme found in the liver and to a lesser extent in the muscles, heart, kidneys and pancreas. The ALT reading is one of the most important tests used to determine liver damage or disease. In healthy individuals ALT levels can vary 10 to 30% from day to day and may fluctuate by as much as 45% in a single day. The highest are found generally in the afternoon and the lowest levels are typically found at night. ALT levels differ slightly between men and women.

**Reference Ranges for Alanine Aminotransferase (ALT)**

Category	ALT Normal Range (IU/L)
Men	0 - 55
Women	0 - 40

The lower the better.

### What causes high ALT

Alcohol abuse, hepatitis, biliary obstruction, chemical and pesticide exposure, obesity, diabetes, influenza, mononucleosis, cirrhosis, pancreatic dysfunction, strenuous exercise, Vitamin B6 deficiency. Many medications may elevate ALT - Tylenol ( Acetaminophen ), antibiotics, anti-fungal drugs, NSAID's, Aspirin, Methotrexate, Statin drugs.

### **Supplemental Support for High ALT**

B-Complex vitamins, Milk Thistle extract, Aged garlic extract, Probiotics, Magnesium

### **Alkaline Phosphatase ( ALP )**

Is an enzyme produced mainly in the liver and bone. Elevated ALP values are used extensively as tumor markers and to diagnose liver disease. They can also be seen in bone injury.

They should always be measured after fasting as food ingestion can raise them by as much as 30 IU/L

### **Reference Ranges for Alkaline Phosphatase ( ALP )**

Category ages	ALP Normal Range (IU/L)
Men 15 - 20 yr	45 - 400
Men 20 - 60 yr	25 - 150
Men 60 - 100 yr	25 - 160
Women 15 - 20 yr	45 - 400
Women 20 - 60 yr	25 - 150
Women 60 - 100 yr	25 - 165

### What causes high ALP

Bone cancer, chemical exposure of heavy metals or pesticides, cirrhosis, celiac disease, autoimmune disorders, biliary obstruction, hyperthyroid disease, excess vitamin D, pancreatic cancer, parasites, sepsis, shingles, viruses such as CMV, hepatitis and mono.

### **Supplemental Support for high ALP**

Milk Thistle extract, magnesium, Aged garlic extract, AHCC

### What causes low ALP

Scurvy, pernicious anemia, zinc deficiency, hypothyroidism, magnesium deficiency.

### **Supplemental Support for low ALP**

Magnesium, Milk Thistle extract, Vitamin B-12, Zinc carnosine

### **Aspartate Aminotransferase ( AST )**

Is an enzyme mainly present in the liver but can be found in the muscles, kidneys, heart, and pancreas. They are typically low unless one of these tissues are damaged and then releases them into the blood stream. Low AST readings are generally a sign of good health and not a cause for concern. The combination of ALT and AST is used to identify liver damage and disease. AST readings can fluctuate between 5 - 10% from one day to the next in the same individual. AST levels are generally higher in African American men than Caucasian men. Moderate exercise can increase AST to almost 3x the normal limit for up to 24 hours.

### **Reference Ranges for Aspartate Aminotranferase (AST)**

AST ( IU/L )	Category
< 5	Low
5 - 40	Normal
> 40	High

### What causes high AST

Alcohol abuse, hepatitis, biliary obstruction, chemical and pesticide exposure, obesity, diabetes, influenza, mononucleosis, cirrhosis, pancreatic dysfunction, strenuous exercise, Vitamin B6 deficiency. Many medications may elevate ALT - Tylenol ( Acetaminophen ), antibiotics, anti-fungal drugs, NSAID's, Aspirin, Methotrexate, Statin drugs.

### **Supplemental Support for elevated AST**

B-complex vitamins, milk thistle extract, aged garlic extract, andrographis extract, cordyceps, AHCC, magnesium, probiotics.

### **Gamma-Glutamyl Transferase (GGT)**

GGT is an enzyme found in numerous tissues throughout the body, including the kidneys, pancreas, spleen, heart, and most significantly in the liver. While an elevated GGT reading suggests liver damage, it cannot reveal the cause of that damage on its own. GGT levels are analyzed in conjunction with ALP readings to help determine the illness of the patient. If both ALP and GGT are high, bile duct disease or liver disease is suspected. GGT is very sensitive to alcohol use - so its elevation may simply be caused by alcohol consumption. GGT levels can vary 10 - 15% from day to day. GGT activity decreases immediately after eating.

### **Reference Ranges for Gamma-Glutamyl Transferase ( GGT )**

Category	GGT Normal Range (IU/L)	GGT Target Range (IU/L)
Men	0 - 65	32.5
Women	0 - 45	22.5

The GGT levels of healthy African Americans are typically twice as Caucasians.

GGT may be 25 - 50% higher in obese individuals and 10% in 1 - pack a day smokers.

### **What causes High GGT**

Alcohol abuse, autoimmune and viral hepatitis, biliary obstruction, COPD, hyperthyroidism, liver disease, influenza, pancreatic dysfunction, RA, strenuous exercise, kidney disease, heart attack.

Numerous prescription drugs such as Tylenol, steroids, antibiotics, anti-fungal, statin drugs, NSAID's, tricyclic antidepressants are some.

### **Supplements to support high GGT**

Phosphatidyl-choline, Probiotics, GTF Chromium, Aged garlic extract, magnesium  
Low GGT support  
Magnesium

*All information on this paper came directly from*

*Your Blood Never Lies - How to read a blood test for a longer, healthier life*

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