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Understanding Liver Blood Tests

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What do your liver enzyme tests mean?

When you go to your primary care physician or your friendly gastroenterologist, you may have a blood test called a "Liver Function Test" or "Hepatic function test" ordered. What are we looking at and why do we care?

This panel of tests checks for enzymes and proteins in the blood that allow us to evaluate the health of your liver. Some of these tests measure how well the liver is performing its normal functions of producing protein and clearing bilirubin. Other liver function tests measure enzymes that liver cells release in response to damage or disease.

AST – Aspartate Aminotransferase and ALT – Alanine Aminotransferase

AST and ALT are enzymes found in the liver and they help the liver perform chemical reactions that your body needs to function. When liver cells are injured, these enzymes are released into your bloodstream in unusual levels which then are calculated in your test results. An elevated AST and ALT is usually a sign of injury or inflammation to the liver cells. Alcohol abuse, fatty liver disease, certain medications and infections are the most common causes for these enzymes levels to be elevated. However, there are several other reasons that can cause elevations. These additional possible reasons are why it is so important for your doctor to be thorough when determining why your AST and ALT are elevated. Often, we are able to provide guidance on how to improve the inflammation in the liver.

Serum bilirubin

Bile is a fluid that is made and released by the liver and stored in the gallbladder. Bile eventually flows out of the liver and gallbladder into the small intestines. Bile helps with digestion and helps break fats down into fatty acids. The main components of bile are water, bilirubin, which is orange-yellow and biliverdin, which is green. When mixed, they are responsible for the brown color of feces.

While Bile has many different substances in it; we test for bilirubin because it tells us how the bile is moving around the liver. When red blood cells get old or damaged, they are broken down and removed from our bodies. As this breakdown occurs, Hemoglobin, the central component of red blood cells, is turned into the waste product bilirubin. Some bilirubin is excreted as bile and some of it is excreted through urine. As gastroenterologists, we are always interested when the bilirubin levels rise. Bilirubin levels can increase for a number of different reasons, such as when there is abnormal destruction of red blood cells. Destruction of red blood cells can occur from certain infections and some autoimmune diseases.

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LIVER FACTS

Your liver is the second largest organ in your body (Your skin is the largest) and is located right under your rib cage on your right side. It weighs about three pounds and is shaped like a football that's flat on one side.
Your liver is important and it has many functions. The top three are that it cleans your blood of toxins, gives you energy and produces bile for digestion. Your liver processes what you eat and drink into nutrients your body uses and filters out harmful substances from your blood.
Different conditions can damage your liver like HEPATITIS and ALCOHOLIC LIVER DISEASE. But one of the most common causes of liver damage these days is excess fat invading your liver or FATTY LIVER DISEASE. About 25% of American adults have excessive fat in their liver which can lead to more serious liver disease. In fact, fatty liver has become the most common reasons for liver transplant. This rise is felt to parallel the rise in obesity in America.

High bilirubin levels can also be a sign that there is a blockage of bile flow out of the liver. Blockages to bile flow can occur from stones in the ducts that bile flows through, a condition called choledocholithiasis, or from liver or pancreatic cancers. When bilirubin levels are increased, our skin and eyes can turn yellow, a condition known as jaundice. In adults, jaundice always needs to be evaluated by a physician. Neonatal jaundice, or increased Bilirubin levels in neonates, is more common because a newborn's immature liver cannot remove bilirubin fast enough. While this yellow color is more common in newborns and is usually benign, it should still always be monitored by an infant's pediatrician. Because high bilirubin levels can be triggered by unusually high breakdown of red blood cells or by blocked bile flow in the liver, we will always perform a thorough work up when we see a patient's bilirubin levels rise.

Alkaline phosphatase (ALP)

Alkaline phosphatase is a protein that is found in all body tissues. Its main sources are liver, bone, placenta and intestines. Increased levels of ALP can be found during periods of active bone growth, pregnancy, or liver and bone disease. This can be normal, such as in pregnancy and in infants and children who are actively growing. However, it can also be from abnormal bone growth and cancer. We also see the ALP levels rise when there is a blockage or slowing of the bile flow through the liver. When we see elevated ALP levels, we need to distinguish whether it is coming from a problem within the liver or from another source in your body. We do this by checking another enzyme called gamma-glutamyltransferase, or GGTP. GGTP is very specific to the liver. If both ALP and GGTP are elevated, this is typically a sign of injury occurring in the liver. An elevated ALP should always be thoroughly investigated by a physician, such as a gastroenterologist.

Albumin and Total protein

Albumin is a protein produced by the liver that circulates in your blood. Albumin is very important and functions to transport other proteins and electrolytes through your body. One of its main functions is to help keep water in your blood vessels by regulating the "oncotic pressure" of blood. When the oncotic pressure in your blood vessels drops, fluid will leak out of your blood vessels and it can cause fluid accumulation in your belly, known as ascites, or in your legs and arms, known as edema. Albumin and total protein levels can be affected by severe malnutrition, which makes it difficult for your liver to make albumin. It can also be affected by chronic liver disease, such as cirrhosis. We monitor albumin levels closely in patients with chronic liver disease, as it is a good indicator of how well the liver is functioning.

PT-INR

Prothrombin time and the International Normalized Ratio, both calculate the same thing. They are tests that help physicians determine how well your blood is able to clot. Clots are our body's mechanism to stop bleeding. The clotting mechanism is very complicated, but we are able to measure how well we can create clots using the PT-INR. Our livers are involved in creating components of the clotting mechanism. When we see the PT-INR rise, we are often concerned that the liver is not functioning well. The PT-INR can also rise due to use of anti-clotting drugs, such as warfarin, that is used to prevent heart attacks and strokes.

Here are typical normal values for the liver function tets. These vary slightly from lab to lab:

TEST	NORMAL VALUES
Bilirubin	< 1.0
Alk Phos	< 130
AST	< 40
ALT	< 40
GGTP	< 48
Albumin	3.5 - 5.0
Protime	12 - 16

Below are liver tests of a patient with **acute viral hepatitis** A. Compare these results to the normal values above. Note the elevated bilirubin causing yellow jaundice and the high ALT and AST liver enzymes reflecting acute damage to liver cells. Patient made a complete recovery with all abnormal blood tests returning to normal 8 weeks later.

TEST	RESULT
Bilirubin	8.0
Alk Phos	130
AST	1850
ALT	2200
GGTP	48
Albumin	4.0
Protime	16

Just one example of how your blood tests can help your doctor take better care of you.